

SCOPE, PROSODY, AND PITCH ACCENT: THE PROSODIC MARKING OF
WH-SCOPE IN TWO VARIETIES OF JAPANESE AND SOUTH
KYEONGSANG KOREAN

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This dissertation investigates the prosodic marking of the semantic scope of wh-phrases in Tokyo Japanese (TJ), Fukuoka Japanese (FJ) and South Kyeongsang Korean (SKK). While the interface between prosody and syntax in TJ has attracted intensive recent interest, the experimental approach pursued in this study addresses the issues which have not been resolved in previous research. It expands the scope of the investigation to include relatively understudied varieties of Japanese and Korean. In addition, it takes information/discourse structure into account, and it focuses on experimental verification of crucial questions such as the relationship between wh and focus intonation.

The scope of wh-phrases in TJ is marked by F0 compression, exhibiting a resemblance to the prosodic pattern of a contrastive focus. In FJ and SKK, on the other hand, wh-scope is marked by a high flat F0 contour and the deletion of accents on the material inside the domain, indicating that the prosodic wh-scope marking and focus marking are distinct. Also, it is argued that the accent type of a wh-phrase determines the implementation of the prosodic scope marking: a rising tone yields the high plateau pattern whereas a falling tone yields F0 compression.

Based on the characteristics of the prosodic scope marking, two

constructions are examined in which the domain of the prosodic scope marking potentially does not correspond to any syntactic constituent. Embedded scope questions with long-distance wh-scrambling have received little attention and varying claims have been made in the literature about their prosodic scope marking. The results of the investigation of this construction reveal that the right edge of the wh-scope marking aligns with the embedded complementizer regardless of the surface position of the wh-phrase.

The other construction involves an in-situ wh-phrase taking matrix scope. The widely accepted wh-island effect is held to block a wh-phrase from taking scope out of a wh-island. However, the results of a production test and a comprehension test demonstrate that both pragmatic context and prosodic scope marking can ameliorate the wh-island effect, highlighting the need for an expanded scope of analysis, one which incorporates the interactivity of prosody, syntax, and information structure observed here.

BIOGRAPHICAL SKETCH

Hyun Kyung Hwang was born on April 17, 1979 in Changwon, South Kyeongsang, South Korea. After graduating from Sungji Women's High School in Masan, she attended Seoul National University (Seoul, South Korea) from 1998 to 2002, where she received her degree of Bachelor of Arts *summa cum laude* in Linguistics. She then enrolled in the graduate program in Linguistics at Seoul National University, where she completed her research project entitled "Spectral Characteristics of Frication Noise in Korean Sibilants" and received her degree of Master of Arts in 2004. Since August 2004, she has been enrolled in the graduate program in Linguistics at Cornell University.

For my parents and husband,
with gratitude and love

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I could not have started this work without the other member of my committee, Michael Wagner. This work had its beginnings in a term paper I wrote for a class of Michael's, *Prosody and Grammar*, in the spring of 2006. When I mentioned my observation about wh-intonation in South Kyeongsang Korean, he immediately noticed that it was the prosodic scope marking of a

wh-phrase, and he introduced me to Ishihara's dissertation involving the comparable phenomenon in Tokyo Japanese. Particularly, the material in Chapter 3 has greatly benefitted from his invaluable and insightful suggestions.

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LIST OF ABBREVIATIONS

Acc	accusative
Cl	classifier
Comp	complementizer
CP	complementizer phrase
Dat	dative
Dec	declarative particle
DP	determiner phrase
FOC	contrastive focus
Gen	genitive
Hon	honorific
I.O.	indirect object
IP	inflection phrase
LF	logical form
Loc	locative
MaP	major phrase
MiP	minor phrase
Neg	negation
Nom	nominative
Past	past tense
PF	phonetic/phonological form
Prog	progressive
Q	interrogative ending
Quot	quotative
Sub	subject
<i>t</i>	trace
Top	topic
TP	tense phrase
V	verb
VP	verb phrase

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this dissertation, I investigate the prosodic marking of the semantic scope of a *wh*-phrase, that is, an interrogative word such as *who* or *what*, as observed in Tokyo Japanese (TJ), Fukuoka Japanese (FJ) and South Kyeongsang Korean (SKK). The prosodic scope marking is referred to as *wh*-*intonation* throughout the dissertation. While *wh*-intonation in TJ has recently become a topic of interest, little attention has been devoted to FJ and SKK. Further, there has been an ongoing debate about the correct description of and the role played by *wh*-intonation in certain contexts. This work provides empirical and theoretical analyses of *wh*-intonation with particular attention given to these contexts in the varieties of Korean and Japanese mentioned above.

Traditionally, formal linguistics assumes a language faculty of modular levels organized in a way that each level feeds serially into the next. Also, linguists have traditionally analyzed a language heavily dependent on impressionistic acceptability judgments about written examples, ignoring other factors such as contextual/discourse plausibility, processing difficulty, and prosody. However, empirical findings in psycholinguistics reveal that the processing involved in linguistic judgments requires complex relations with various linguistic/non-linguistic properties (Thelen and Smith 1994, Elman et al. 1996, Schütze 1996, Barsalou et al. 2007). These results suggest that simply attributing the acceptability/unacceptability to “grammatical knowledge” is not adequate, and that we should revisit constraints that have been assumed

to exist in the grammar of a language based on impressionistic judgments alone. Thus, the proposal I pursue in the current dissertation treats acceptability judgments as involving not only the syntactic structures of examples but also processing difficulties, memory limitations, biases, experience, knowledge of the world and so on.

In this dissertation, I am concerned primarily with the interface between syntax and prosody as they relate to prosodic phrasing. It is commonly assumed that prosodic phrasing is syntactically grounded in a way such that prosodic boundaries correspond to edges of syntactic constituents (Selkirk 1986; 2003, Truckenbrodt 1995; 1999). However, the information provided by syntactic edges alone does not suffice to characterize wh-intonation observed in the languages at issue in that a boundary of wh-intonation does not necessarily align with the edge of a complete syntactic constituent (Gim 1970, Hayata 1985, Kubo 1989, Tomioka 1997, Deguchi and Kitagawa 2002, Ishihara 2002).

Descriptively, it is well established that wh-intonation is initiated by a wh-phrase. Together with the significance of the surface position of a wh-phrase, two language specific characteristics in Japanese and Korean—the presence of long-distance scrambling (henceforth LD-scrambling) and wh-in-situ—offer implications for our understanding of the syntax-prosody mapping because there are cases where the two contexts manifest disparity between the surface position of a wh-phrase and its semantic scope, as schematized below. Wh-phrases and interrogative complementizers are represented in **boldface** and with a Q, respectively.

(1.1) a. LD-scrambling in an indirect wh-interrogative

[**wh** [*t_{wh}* Q_{wh}] Q]

b. wh-in-situ in a direct wh-interrogative

[[**wh** Q] Q_{wh}]

LD-scrambling describes contexts where material is placed outside the syntactic domain of the complementizer which determines its semantic scope. As presented in (1.1a), in an indirect wh-interrogative in Japanese or Korean, the embedded wh-phrase is fronted from its underlying position and occupies the initial position of the sentence across a clause boundary. Notice that the position is outside the embedded clause, *i.e.* the domain of its head (embedded Q). Since it is widely accepted that LD-scrambling does not change the propositional content of a sentence (Kuroda 1988, Saito 1989, Fukui 1993, Saito and Fukui 1998), its semantic scope is still the embedded clause while the LD-scrambled wh-phrase is located in the matrix clause. The domain of wh-intonation in this construction has received little attention, and varying claims have been made in the literature. Another interesting case is shown in (1.1b): though a wh-phrase is located in the embedded clause, yet the in-situ wh-phrase takes matrix scope.¹

The exact domain of wh-intonation and the role of the prosodic scope marking in the above contexts are the central issues addressed in this study.

¹ It is debatable both in Japanese and Korean whether the construction in (1.1b) is acceptable as a direct wh-interrogative. Such cases are traditionally known as wh-islands. Note that the construction (1.1b) is scopally ambiguous if the embedded wh-phrase is allowed to take matrix scope. In that case, it is reasonably expected that the two scope interpretations yield distinct patterns of wh-intonation. See §1.2.2 for a detailed discussion regarding the wh-island effect.

Those are investigated through experiments in which prosody and contextual plausibility are strictly controlled.

In the remainder of this chapter, I present overviews of the syntactic structures (§1.2), prosodic patterns (§1.3), and information-structural patterns (§1.4) at issue. In §1.5, I provide a brief overview of the remaining chapters.

1.2 Syntactic structure

In pursuing the research of the syntax-prosody interface with a focus on wh-interrogatives in TJ, FJ and SKK, it is necessary to specify the relevant syntactic structure in those languages. In this section, I describe the complementizers (henceforth Comp) used in wh-interrogative constructions in Japanese and Korean. This will provide a basis for discussion in later chapters.

1.2.1 Complementizers in Japanese and Korean

I begin by presenting the structure at issue in (1.2).

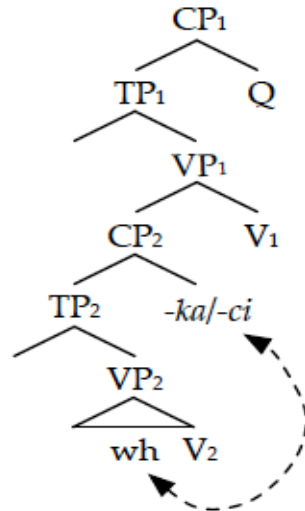
(1.2) Structure of scope-ambiguous wh-interrogatives

[CP₁ [CP₂ **wh** V₂-*ka/-ci*] V₁-Q]

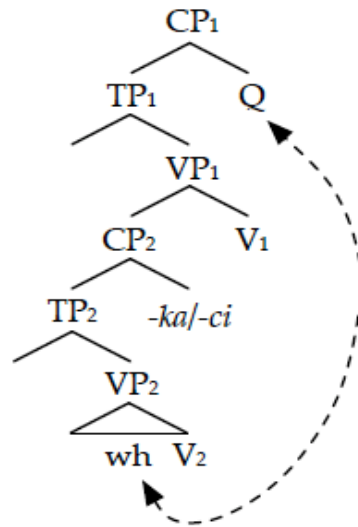
The embedded wh-phrase is associated with the embedded Comp *-ka* (Japanese) */-ci* (Korean) resulting in a yes/no question. For some speakers, the wh-phrase is permitted to associate with the matrix interrogative ending Q. More on the variable judgments on the interpretation of the wh-scope in this structure is addressed in the following section and in Chapter 4. The two scope interpretations are graphically presented in (1.3).

(1.3) Two interpretations of an in-situ wh-phrase with respect to wh-scope

a. embedded scope



b. matrix scope



The question ending Q varies depending on the style of the utterance. This is summarized in Table 1.1. While the formal and informal endings were tested for SKK, the formal and casual endings were used for Japanese.

Table 1.1. Q endings and their scope-sensitivity

Style	Property	TJ	FJ	SKK
formal	+Q, \pm wh	-ka	-ka	-pnika
informal	\pm Q, \pm wh			-eyo
casual	\pm Q, \pm wh	-no	-to	
	+Q, -wh	-nokai		-na
	+Q, +wh	-ndai		-no

The formal endings in the languages are question-specific but scope-neutral (indicated by $[\pm wh]$). SKK informal endings and Japanese casual endings are not question-specific. These endings also function as Comps for declaratives. Notice that all endings are ambiguous with respect to their $[wh]$ property, except SKK *-na/-no* and Japanese *-nokai/-ndai*, which are morphological scope markers. Note that *wh*-interrogatives with these scope-neutral endings are potentially ambiguous. SKK *-na/-no* are more frequently used compared to their Japanese counterparts in that the endings obligatorily appear in questions of casual style in SKK. In contrast, the Japanese *-nokai/-ndai* endings are optionally used in blunt-style utterances, mainly by male speakers. For ambiguity's sake, scope-neutral Q endings are used unless noted.

The embedded Comp *-ka*² in Japanese and *-ci* in Korean correspond to *whether* in English. These Comps are not permitted to drop in either language, unlike matrix Q endings in Japanese. It should be noted that these interrogative Comps can appear in both yes/no questions (1.4a) and *wh*-questions (1.4b), as presented below.

² There is another Comp *-kadooka* 'whether', which is $Q_{[-wh]}$. However, Deguchi and Kitagawa (2002) note that it can be both $[+wh]$ and $[-wh]$ for some speakers. The counterpart in Korean would be *-ci ettenci*, but it is not frequently used in colloquial speech.

- (1.4) a. Keesatsu-wa [Yumi-ga Naoya-ni atta-ka] siritakatta.
 Police-Top [Yumi-Nom Naoya-with met-Comp_[-wh]] wondered
 ‘The police wondered whether Yumi met Naoya.’
- b. Keesatsu-wa [Yumi-ga **dare**-ni atta-ka] siritakatta.
 Police-Top [Yumi-Nom who-with met-Comp_[+wh]] wondered
 ‘The police wondered who Yumi met.’

While only TJ examples are given in (1.4), FJ and SKK exhibit the same behavior along these dimensions; the status of the Comps *-ka/-ci* seems to be unspecified with respect to [wh] values.³ Yet, as the Comps are question-specific, it has been believed that they form a wh-island blocking the embedded wh-phrase from taking the matrix scope.

1.2.2 The wh-island effect

Korean and Japanese are so-called wh-in-situ languages; thus a wh-phrase occupies the same position that its non-wh counterpart does, as presented in (1.5b).

- (1.5) a. Taroo-wa hon-o katta-no? ‘Did Taroo buy the book?’
 Taroo-Top book-Acc bought-Q?
- b. Taroo-wa **nani**-o katta-no? ‘What did Taroo buy?’
 Taroo-Top what-Acc bought-Q?

Unlike in English, where movement of a wh-phrase to its scope position is

³ Kitagawa (2005a, b) also represents the Comp with different values: *-ka_{whether}* and *-ka_{wh}*. He suspects that the strength of the [wh] value on the complementizers might be different among different speakers, resulting in the varying acceptability.

mandatory, no obligatory wh-movement is observed in Korean or Japanese. It is traditionally considered in these languages that an in-situ wh-phrase undergoes *covert* movement (Huang 1982); while the in-situ wh-phrase moves to its scope position at LF, the movement is *covert* in that it does not affect the phonology. Let us look at the difference between languages with *overt* and *covert* movement, respectively, in a bi-clausal interrogative with an embedded wh-phrase. An English example is given below, where traces of the moved interrogative words are indicated by italicized *t*.

- (1.6) a. John knows [Mary likes DP]
 b. embedded scope: [Does John know [**what** Mary likes *t_{what}*]]?
 c. matrix scope: [**What** does John know [Mary likes *t_{what}*]]?

When a determiner phrase (henceforth DP⁴) located in an embedded clause is the interrogative word *what*, it moves either to the initial position of the embedded clause, resulting in a yes/no question (as in (1.6b)) or to that of the matrix clause, resulting in a wh-question (as in (1.6c)). As is obvious in (1.6), due to the *overt* wh-movement in English, the two types of questions are clearly distinguishable. However, since Japanese and Korean do not have obligatory displacement of interrogative words, this means of marking scope is not available in these languages. This raises the possibility that an embedded wh-phrase in a bi-clausal interrogative in Korean and Japanese is scope-ambiguous, as shown in (1.7).

⁴ *DP* and *noun phrase* (NP) are considered interchangeable terms in this dissertation.

- (1.7) Keesatsu-wa [Yumi-ga **dare**-ni atta-ka] siritakatta-no?
 police-Top [Yumi-Nom who-with met-Comp wondered-Q?
- a. [Did the police wonder [who Yumi met]]?
- b. [Who did the police wonder [whether Yumi met t_{who}]]?

Similar observations were reported for in-situ wh-phrases in English (Baker 1970), as shown in (1.8).

- (1.8) [**Who**₁ knows [**who**₂ bought **what**]]?

What is of interest is the semantic scope of the in-situ wh-phrase *what*: it can take either embedded scope with *who*₂ in the embedded clause or matrix scope with *who*₁ in the matrix clause. The latter reading where *what* takes matrix scope is somewhat unexpected based on the ungrammaticality of the question in (1.9), where a wh-phrase violates the wh-island effect.

- (1.9) *What do you know [whether he bought t_{what}]?

The unavailability of the matrix scope reading for *what* in (1.9) has been characterized as a wh-island violation. The wh-island effect bans the embedded wh-phrase from taking scope over the island which was created by an interrogative element, *whether* in (1.9). The apparent violation of the wh-island effect in (1.8) and the ambiguity as to the scope of the in-situ wh-phrase was attributed to the absence of overt wh-movement: an in-situ wh-phrase is immune to the wh-island effect. This conclusion has been widely accepted in much of the literature.

However, the availability of the matrix scope reading in the construction under consideration has been controversial in Japanese and Korean, representative *wh*-in-situ languages. In TJ, it has been argued that an embedded *wh*-phrase is not permitted to take scope over the embedded Q Comp (Nishigauchi 1990, Watanabe 1992, Yoshida 1998, Richards 2000). On the other hand, Lasnik and Saito (1984) and Takahashi (1993) claim that the matrix scope reading *is* available. In particular, the matrix scope reading in violation of the *wh*-island effect was found to be acceptable in recent studies where prosody was seriously taken into account (Tomioka 1997, Deguchi and Kitagawa 2002, Ishihara 2003, Hirotsu 2005). These prosodic accounts are discussed in greater detail in Chapter 2.1. In Korean, similar disagreement has been reported: while the matrix scope interpretation was not judged to be acceptable by H.S. Lee (1982), H.S. Han (1992), or H.S. Choe (1995), it was judged available by C.M. Suh (1987), H.K. Hwang (2006), and H.J. Hwang (2007).

One might naturally wonder: if scope ambiguity is present in the constructions in question, what are the factors that disambiguate it? I return to a fuller discussion of this issue in Chapter 4, where I argue that ambiguity is resolved by discourse context and prosody. The prosodic structure of the languages at issue is sketched out in the following section.

1.3 Prosodic structure

In this section, I first review the fundamental aspects of the lexical tonal systems of TJ, FJ and SKK (§1.3.1); I then review prosodic phrasing (§1.3.2), focusing on the Minor Phrase (MiP) and the Major Phrase (MaP), which are relevant to the later discussion. I begin with the TJ accent system, which has

been investigated in a number of studies.

1.3.1 Lexical accent system

The property of particular interest in the current dissertation concerning the accent system in Japanese is ‘accentedness’ and its influence on pitch realization. It is widely assumed that there are two tones – H(igh) and L(ow) in Japanese (Kubozono 1988, Pierrehumbert and Beckman 1988, among others). Lexical items which exhibit a pitch fall (H^* to L) are referred to as *accented*, otherwise as *unaccented*. Given that a wh-phrase in both TJ and FJ is lexically accented - *dáre* ‘who’, *náni* ‘what’, the effect of accentedness on the F0 of the following material is crucial for our discussion.

It has been convincingly argued that an F0 peak of material following an accented word is noticeably lower than that following an unaccented word (Poser 1984, Kubozono 1988, Pierrehumbert and Beckman 1988, Nagahara 1994). This is schematized in Figure 1.1 below. U and A refer to unaccented and accented items, respectively. Indications (A, U) and arrows are added by the author.

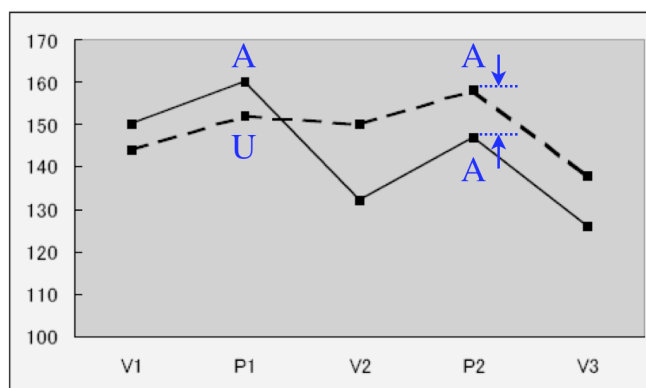


Figure 1.1. Schematic pitch contours of accented words following an accented word (solid line) and an unaccented word (dashed line) (Kubozono 2007, p. 5)

This F0 lowering effect produced by preceding accented items is called either *catathesis* (Poser 1984, Pierrehumbert and Beckman 1988), or *downstep* (Kubozono 1988, Tateishi 1991). The term *downstep* is used throughout this dissertation. There are two ways to test whether downstep is present; syntagmatically by comparing the F0s of two adjacent phrases within a single utterance, or paradigmatically by comparing the F0s of two utterances (Kubozono 2007). The syntagmatic diagnostic has been used in much of the literature (Selkirk and Tateishi 1991, Nagahara 1994, Hirotani 2005, among others). Yet, it is not a trivial issue to diagnose the presence or absence of downstep using the syntagmatic diagnostic since it is not obvious how much F0 lowering is necessary as an indication of downstep. Instead, Kubozono (1988, 2007) compared F0s of two utterances; accented-accented items and unaccented-accented items. One example pair presented by Kubozono (1988) is given below. An accented mora is indicated with an acute accent mark.

- (1.10) a. umái méron
b. amai méron

Kubozono (1988) reports that while no substantial F0 difference was observed between F0s of the two accented words in (1.10a), the second word *méron* exhibited a lower F0 peak when preceded by an accented word as in (1.10a) compared to when preceded by an unaccented word (1.10b). Thus, he concludes that the second accented word in (1.10a) is downstepped by the accentedness of *umái*. Similarly, Kubozono (2007) tests wh-interrogatives in different prosodic conditions with respect to the accentedness of preceding

material. The prosodic conditions and examples are presented below.⁵

- (1.11) a. [AA-wh] anáta-wa Aótori-de Náoko-to **náni-o** mimásita-ka?
you-Top Aomori-Loc Naoko-with what-Acc saw-Q
- b. [AU-wh] anáta-wa Aótori-de Naomi-to **náni-o** mimásita-ka?
you-Top Aomori-Loc Naomi-with what-Acc saw-Q
- c. [UA-wh] anáta-wa Oomori-de Náoko-to **náni-o** mimásita-ka?
you-Top Oomori-Loc Naoko-with what-Acc saw-Q
- d. [UU-wh] anáta-wa Oomori-de Naomi-to **náni-o** mimásita-ka?
you-Top Oomori-Loc Naomi-with what-Acc saw-Q

The results show that the F0s of wh-phrases are considerably lower when following accented items than when following unaccented ones. Specifically, AA (1.11a) and UU (1.11d) sequences exhibited the greatest F0 differences. The schematic contours of the AA and UU type adopted from Kubozono (2007) are presented in Figure 1.2.

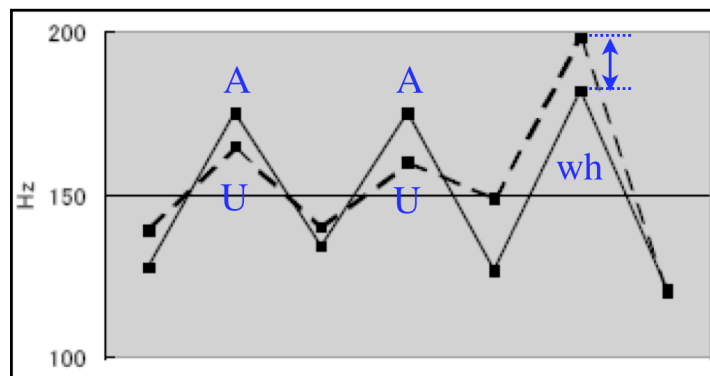


Figure 1.2. Schematic pitch contours of a wh-phrase following AA (solid line) and UU (dashed line) uttered by speaker AO (Kubozono 2007, p. 18)

⁵ It should be noted that Kubozono (2007) assumes that wh receives non-contrastive focus.

As expected, the accented items exhibit greater F0 peaks than their unaccented counterpart. More importantly, the peak of the wh-phrase in the AA condition is noticeably lower than that in the UU condition. The difference is attributed to the presence or absence of the accentedness of the preceding material, suggesting that downstep has occurred in AA condition. This result indicates that non-contrastive focus (wh) does not necessarily block downstep and reset a new MaP, and also that it is difficult to determine purely syntagmatically whether downstep is present or not. Nevertheless, the presence or absence of downstep has been the diagnostic for prosodic phrasing, which is reviewed in the following section.

In FJ, adjectives and verbs are obligatorily accented, and the location of the accent is fixed on the penultimate syllables (Hayata 1985). Since accentedness is contrastive only for nouns, adjectives and verbs in FJ are more restricted in terms of their accentual pattern. Furthermore, the accentedness of wh-phrases in TJ is preserved in phrases and sentences in general, whereas it is deleted in interrogatives in FJ (Hayata 1985, Kubo 1989).

Let us turn to the accent system in SKK. While there is consensus that SKK, along with North Kyeongsang Korean (henceforth NKK), is a pitch accent language (Ramsey 1978, K. Chung, 1980, Jun et al. 2006, Kenstowicz and Park 2006, S.E. Chang 2007), the lexical accent groups and their particle-dependent alternation in this variety of Korean have not been fully clarified in the previous literature by controlled experimental studies. Yet, there is general consensus that there are three distinctive accent classes for monosyllabic words (W. Huh 1954, C.G. Gim 1978, Ramsey 1978, S.E. Chang 2007); these are labeled intuitively as H(L), H(H) and R in the current study.⁶

⁶ Different claims have been made regarding contrastive tones of monosyllabic

An example of each class and its accent alternation in derived forms are given below. I employ the Yale Romanization to transliterate Korean examples. A low and rising tone are marked with a grave (`) and a hacek (ˇ), respectively. The tones in parentheses indicate those of the following case markers.

(1.12) Three accent classes of monosyllabic words in SKK

- | | | | | |
|----------|------|--------|--------|------------|
| a. H(L): | mwún | 'door' | mwún-ì | 'door-Nom' |
| b. H(H): | nwún | 'eye' | nwún-í | 'eye-Nom' |
| c. R: | nwŭn | 'snow' | nwùn-í | 'snow-Nom' |

A monosyllabic word belonging to the first group exhibits an H tone in the initial syllable followed by an abrupt F0 fall.⁷ This is extremely similar to the accent pattern of an item in the second group in citation. In fact, if produced in isolation, segmentally identical words of the two groups are not distinguishable. A crucial difference between the groups lies in the tone alternation; a particle following an item of the second group is realized as high resulting in a H(H) pattern. This unusual pattern has been named as preaccent (Ramsey 1975), double H (Kenstowicz and Sohn 2001) or doubly linked H (J.H. Jun et al. 2006). The last class shows a rising pitch pattern in isolation.

words in SKK: H, L and M(id) tone by W. Huh (1954) and C.G. Gim (1978) based on auditory impression, two atonic and a preaccent group by Ramsey (1975) grounded on historical facts and tone alternation, H, M and R by S.E. Chang (2007) based on empirical data, or only H and L by K. Chung (1980) and M.O. Choi (1998) parallel to NKK.

⁷ When a consonant-initial polysyllabic particle follows, a high tone is observed in the second syllable, as in *mwun-póda* 'door-than' (Ramsey 1975, M.J. Kim 1996, S.E. Chang 2007). This behavior has been explained by the assumption that a consonant-initial polysyllabic particle bears an H tone on the first syllable while a vowel-initial suffix and a consonant-initial monosyllabic particle are toneless. See M.J. Kim (1996) for further discussion.

Yet, when followed by a particle, an H tone is observed not in the root, but in the particle. Thus, the R tone is observed only in monosyllabic words in isolation.

Turning to disyllabic words in SKK, there are four different classes depending on the tone alternation pattern (Ramsey 1975, S.E. Chang 2007, Utsugi 2009).

(1.13) Four accent classes of disyllabic words in SKK

- | | | | | |
|-----------|--------|----------|-----------|--------------|
| a. HL(L): | ánay | ‘wife’ | ánay-ka | ‘wife-Nom’ |
| b. HH(L): | nálgáy | ‘wing’ | nálgáy-ka | ‘wing-Nom’ |
| c. LH(H): | angáy | ‘fog’ | angáy-ká | ‘fog-Nom’ |
| d. LH(L): | talí | ‘bridge’ | talí-ka | ‘bridge-Nom’ |

Again, class LH(H) and LH(L) are not perceptually distinguishable when produced in isolation. This seemingly unusual distinction has different tonal origins in Middle Korean: LH(H) from RH or RL and LH(L) from LL tones.

Given the accent classes above, let us look at the accent patterns of wh-phrases in SKK. Recall that wh-phrases in Japanese bear H*+L tones. In SKK, on the other hand, wh-phrases generally exhibit R for a monosyllabic wh-phrase or LH(H) pitch pattern for a polysyllabic one. Yet, I observe that two wh-phrases *myeoch* ‘how many’ and *nwukwu* ‘who’ allow alternating accent patterns R~H(H) and LH(H)~HH(L), respectively.

(1.14) Lexical accent patterns of wh-phrases in SKK

- | | | | |
|------------------|--------|----------|---------|
| a. nwúkwú~nwukwú | ‘who’ | b. mwués | ‘what’ |
| c. encéy | ‘when’ | d. etisé | ‘where’ |

- | | | | |
|-----------------|------------|--------|-------|
| e. ettéhkéy | 'how' | f. wăy | 'why' |
| g. myěch~ myéch | 'how many' | | |

Sample F0 tracks of the pairs in (1.14a) and (1.14g) are illustrated below, which were produced in isolation by the author. For an easier comparison, the accusative marker *-(l)ul* follows the wh-phrases. As the wh-phrase *myech* requires a classifier in most usages, the classifier for people *-myeng* is attached to *myech*. The coda /ch/ of this item is nasalized by the following /m/ of the classifier. The LH(H) tone is drawn with a solid line and the HH(L) tone with a dashed line.

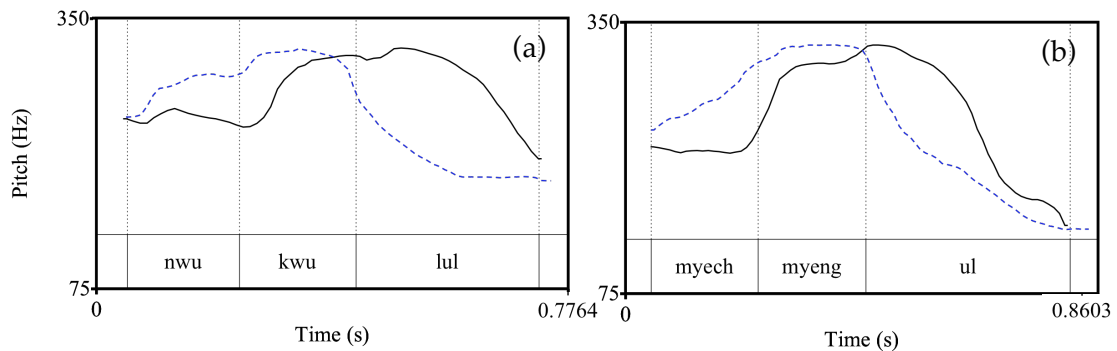


Figure 1.3. F0 contours of accent alternation: (a) *nwukwu-lul* (b) *myech-myeng-ul*

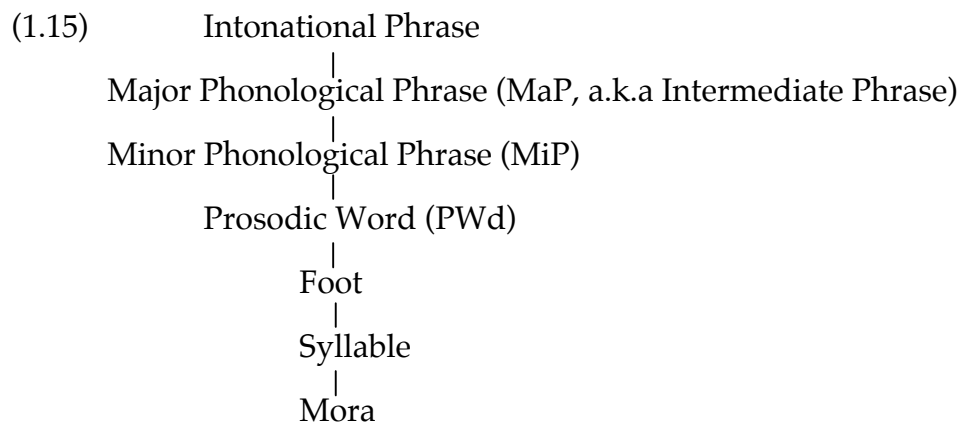
In Figure 1.3(a), the F0 of LH remains low throughout the first syllable. It starts rising and reaches a peak in the second syllable, and remains high in the middle of the vowel in the accusative marker. On the other hand, the F0 of HH demonstrates higher start, earlier rising and abrupt fall in the accusative marker. Figure 1.3(b) shows a similar contrast.

Interestingly, I observe that the phonetic implementation of wh-intonation in this variety is determined by the lexical accent of wh-phrases:

while the high plateau pattern follows a rising tone, the F0 compression pattern is observed in the material following a falling tone. Distinct intonation patterns dependent on lexical accents are also reported in the realization of focus in NKK: while focused HL and HH exhibit an F0 boost in the accented syllable and an F0 compression of the following material, no apparently noticeable F0 change is observed with focused LH (J.H. Jun et al. 2006, H.S. Lee 2008). More details regarding distinct intonation patterns dependent on the lexical accentss of wh-phrases are discussed in Chapter 2.

1.3.2 Phrasing

With regard to phrasing in TJ, I adopt the prosodic hierarchy proposed by Pierrehumbert and Beckman (1988), which is presented in (1.15).



The prosodic constituents that are particularly relevant for this dissertation are the *Major Phonological phrase* (henceforth MaP) and the *Minor Phonological Phrase* (henceforth MiP). A MiP is the domain of initial lowering (Poser 1984, Pierrehumbert and Beckman 1988, Selkirk and Tateishi 1988, Kubozono 1993, Sugahara 2003). At most one accent can occur in a MiP. On the other hand, a

MaP is characterized by two intonational phenomena: downstep and pitch reset (Poser 1984, Pierrehumbert and Beckman 1988). Recall that downstep is the compression of the pitch range after a lexical accent (H^*+L). A MaP is the domain of the F0 compression. At the left edge of a new MaP, the compressed pitch range is expanded with a blocking of the prior downstep, which is referred to as *pitch reset*. In other words, pitch reset signals a new MaP. Notice that both the MaP and the MiP are defined in terms of F0 excursion size indicating that it is not possible to diagnose the presence or absence of phrasing independently from F0 excursion size.

In FJ, it is known that phrasing is similar to that of TJ (Hayata 1985). Thus I assume the same prosodic framing and phonetic cues for the MaP or the MiP in TJ can be employed to identify the presence or absence of a phrase boundary in FJ.

In SKK, due to the lack of prior research on prosodic phrasing, I introduce a study where the phrasing of North Kyeongsang Korean, which is very similar to SKK with respect to prosodic structure, was examined. J.H. Jun et al. (2006) argue that while the Intonational Phrase (IP) in NKK is indicated by final lengthening and a boundary tone, the Intermediate Phrase (ip) is indicated by downstep. It seems that an Intermediate Phrase in NKK corresponds to a MaP in Japanese in that both are characterized by the same intonational phenomenon, namely downstep. In fact, this level of phrase has been referred to with various names even in Japanese including the term *Intermediate Phrase* (Pierrehumbert and Beckman 1988): *MaP* in McCawley 1968, Shibatani 1972, Poser 1984, *Voicing Unit* in Fujisaki and Sudo 1971, *Intonational Phrase* in Miyara 1981. Thus, I employ the term *MaP* for all the languages at issue.

1.4 Information structure

In this section, the basic notions of information structure necessary for the discussions in the remainder of this dissertation are summarized, following Chafe (1976) and Krifka (2007). Also, I review previous studies on the prosodic encoding of information status in the languages at issue. I will begin with *focus*, and *discourse-given* and *discourse-new* are discussed later in this section.

The notion *focus* has been explicated in intuitive ways, such as ‘highlighting’ or ‘the most important’ or ‘new’ information in an utterance. Following Rooth (1985, 1992) and Krifka (2007), I adopt the notion of focus indicating the presence of alternatives, which is characterized below.

(1.16) Focus indicates the presence of alternatives that are relevant for the interpretation of linguistic expressions.

Pragmatically, focus highlights the part of an answer that corresponds to the wh-part of a constituent question (Paul 1880). Hamblin (1973) interprets a question as a set of propositions, each of which is the denotation of a congruent answer. The answer identifies one of these propositions. This use of focus is called *presentational* or *informational focus*. Another use of focus is *contrastive focus* (henceforth FOCUS), which has a limited set of alternatives (Chafe 1976). The typical use of contrastive focus is corrective (Krifka 2007). FOCUS is referred to as various terms: *contrastive focus* (Lambrecht 1994, Selkirk 2002, Sugahara 2003, Kratzer 2004), *identificational focus* (É. Kiss 1998) or simply *focus* (Nagahara 1994, Truckenbrodt 1995). The prosodic encoding of FOCUS has recently attracted considerable attention in the prosodic literature,

whether or not the term *contrastive focus* is explicitly used. It has been widely assumed that FOCUS is marked by particular prosodic patterns (Selkirk 2002, Molnar 2001, Gussenhoven 2004, among others).

Concerning the prosodic effect of FOCUS in TJ, Pierrehumbert and Beckman (1988) show that the F0 range of FOCUSed phrases expands and the F0 of post-FOCUS phrases is compressed. Nagahara (1994) corroborates the finding of Pierrehumbert and Beckman (1988) by showing that FOCUS initiates a new MaP (Intermediate Phrase in their terminology) at its left edge and triggers the dephrasing of all following MaP boundaries. This claim has been adopted in many phrasing accounts for FOCUS (Trockendbrodt 1995, Hirotsu 2005, Richard 2006). The material tested in Pierrehumbert and Beckman (1988) is given below.

(1.17) Tested sentences in Pierrehumbert and Beckman (1988)

- a. amerika-ní-wa amai KÉEKI-wa arimásu-ga
America-Loc-Top sweet cake-Top be-but

amai AMÉ-wa arimasén.
sweet candy-Top not.be

‘In America there are sweet CAKES, but there aren’t sweet CANDIES.’

- b. amerika-ní-wa umái NINZIN-wa arimásu-ga
America-Loc-Top tasty carrot-Top be-but

umái MAMÉ-wa arimasén.
tasty bean-Top not.be

‘In America there are tasty CARROTS, but there aren’t tasty BEANS.’

- c. amerika-ní-wa umái KÉEKI-wa arimásu-ga
America-Loc-Top tasty cake-Top be-but

umái AME-wa arimasén.
tasty candy-Top not.be

‘In America there are tasty CAKES, but there aren’t tasty CANDIES.’

- d. amerika-ní-wa amai NINZIN-wa arimásu-ga
America-Loc-Top sweet carrots-Top be-but

amai MAMÉ-wa arimasén.
sweet bean-Top not.be

‘In America there are sweet CARROTS, but there aren’t sweet BEANS.’

Pierrehumbert and Beckman (1988) compare (1.17a) ‘amai AME-wa’ and (1.17b) ‘umái MAMÉ-wa’. Based on the result that the F0 peaks of nouns in the two conditions are not different, they conclude that FOCUS resets a pitch range by blocking downstep. This view is widely adopted in later studies of Japanese prosody. However, it would be more accurate to interpret the capitalized nouns as contrastive topic, rather than FOCUS, in that they do not evoke alternatives, and they are followed by the topic marker *-wa* in Japanese. Second, as also pointed out by Kubozono (2007), it is unclear as to why Pierrehumbert and Beckman (1988) do not compare (1.17a) and (1.17c) or (1.17b) and (1.17d), which are pairs of an adjective of different accent and segmentally equivalent noun.

On the other hand, based on his experimental results, Poser (1984) argues that FOCUS (emphasis in his terminology) does not necessarily reset an F0 range creating a new MaP boundary. Similar observations are reported

by Kubozono (1998, 2007) where FOCUSed material is downstepped when it follows an accented word. The discussion concerning FOCUS and phrasing is taken up in Chapter 2 as wh-intonation in TJ exhibits an extremely similar phonetic manifestation misleading the assumption that wh-intonation is the same as the intonation pattern induced by FOCUS.

Turning to *givenness* and *newness*, Chafe (1976) defines *given information* as “that knowledge which the speaker assumes to be in the consciousness of the addressee at the time of the utterance”, while *new information* is defined as “what the speaker assumes he is introducing into the addressee’s consciousness by what he says”. Likewise, discourse-givenness is defined as a denotation which has been evoked in the prior discourse context. Newness has been interpreted as ‘information focus’ (Halliday 1967). Yet, discourse-given material can be focused.

(1.18) A: Who stole the cookie, John or Mary?

B: JOHN stole the cookie.

In order to avoid confusion, discourse-newness is defined as a denotation which has not been present in the prior discourse. Similar three-way information status marking is argued for by Selkirk (2007); F-marking of FOCUS, G-marking of discourse-given constituents, and unmarked status of discourse-new constituents in English.

Prosodically, discourse-given material is predicted to be nonprominent (Ladd 1980, Selkirk 2006). Féry and Samek-Lodovici (2006) propose the effect below.

(1.19) Destress Given (Féry and Samek-Lodovici 2006)

A given phrase is prosodically nonprominent.

On the other hand, discourse-new material is expected to be realized with greater prosodic prominence than discourse-given constituents. It is an interesting issue as to whether FOCUS, discourse-new, and discourse-given are all prosodically distinguishable. Experimental results regarding this issue are discussed in Chapter 3.

Sugahara (2003) provides the only previous experimental study where the prosodic effect of different information status was explored in TJ. She tested the role of discourse-givenness/newness inside a FOCUS domain in prosodic phrasing. Recall that it was argued that MaP boundaries are all deleted when following a FOCUSED element (Pierrehumbert and Beckman 1988, Nagahara 1994, Truckenbrodt 1995). Based on the F0 excursion size of a phrase following FOCUS, she concluded that while a MaP is dephrased when the post-FOCUS phrase is discourse-given, MaP is preserved at the left edge of the phrase when it is discourse-new. A similar finding regarding the influence of discourse factors on F0 excursion size in post-wh material is reported in Chapter 3 of this study.

To my knowledge, the role of information structure on prosody has not been systematically examined in SKK or FJ. Igarashi (2007) impressionistically observes that the intonation pattern induced by FOCUS in FJ is comparable to that in TJ. Kenstowicz and Sohn (1997) argue that FOCUS triggers onset of phonological phrasing and dephrasing of the following material in North Kyeongsang Korean, which is prosodically extremely similar to SKK. Although they do not address exactly what acoustic cues signal phonological

phrasing or dephrasing, it is reasonable to think that F0 compression of the post-FOCUS material is associated with dephrasing as in Japanese. This description is in accordance with the observation in H.K. Hwang (2006) and Igarashi (2007) where F0 raising of the FOCUSed item and F0 compression of the post-FOCUS material in SKK and FJ are reported. Thus, the intonation pattern triggered by FOCUS in the languages seems to be structurally identical: an F0 boost of the FOCUSed element and an F0 compression of the following material.

1.5 Outline of the dissertation

The purpose of this study is to investigate the prosodic marking of the scope of *wh*-phrases observed in *wh*-interrogatives in TJ, FJ and SKK.

In exploring prosodic scope marking in TJ, FJ and SKK, all pitch accent languages, I address three specific goals. The first is to provide a better description of *wh*-intonation in TJ, FJ and SKK based on a wide variety of data. It is essential to closely examine the *wh*-intonation pattern since the fine-grained description of this pattern can be a solid basis for the remaining issues of the study. The second is to explore the *wh*-intonation pattern in LD-scrambling contexts where a *wh*-phrase takes embedded scope but it is located outside the scope position. *Wh*-intonation in this context, which has not been resolved in TJ, will play a crucial role in helping us to understand the correspondence of scope and prosody in the languages at issue. Third, I reexamine the standard view of *wh*-scope assignment, namely the *wh*-island effect, focusing on the role of *wh*-intonation in cueing *wh*-scope. The structure of the *wh*-island effect is another instructive context since the surface position of the *wh*-phrase (embedded clause) and its scope (matrix clause) are distinct.

Methodologically, as reviewed in the previous sections, experimental work has been largely lacking in formal accounts particularly in FJ and SKK. It is worth reiterating that majority of syntactic theories have relied on evidence from intuitive grammaticality/acceptability judgments which were obtained based on written examples. Yet, an adequate understanding of prosodic scope marking will only arise through systematic consideration of lexical accents, prosodic phrasing, syntactic structure and information structure, which requires controlled experimental approaches. Thus, in the current study, I explore prosodic scope marking experimentally, taking the various factors into account. Also, in my experimental approach, the issues were examined on the basis of parallel datasets for the three languages.

The structure of the remaining chapters is as follows. In Chapter 2, the phonetic implementations of *wh*-intonation are investigated with respect to lexical pitch accents. The results confirm that *wh*-intonation in TJ suppresses the F0 range of lexical accents inside the domain as reported in the previous studies. On the other hand, the accents of the material inside the *wh*-domain are deleted completely in SKK and partially in FJ. Also, it is revealed that the implementations of prosodic scope marking are determined by the lexical pitch accent of the *wh*-phrase: pitch compression triggered by a falling tone and a high plateau triggered by a rising tone. The high plateau pattern is particularly instructive as it shows that *wh*-intonation and FOCUS intonation are distinct, suggesting that the two should be distinguished. Based on the empirical observations above, I provide a general characterization of *wh*-intonation in the three languages.

In Chapter 3, the puzzle regarding the domain of *wh*-intonation in the context of LD-scrambling (1.1a) is examined by taking information structure

seriously into account. Experimental results where SKK and FJ were incorporated reveal that the right edge of the wh-intonation domain aligns with the embedded Comp where the scrambled wh-phrase takes its scope. I argue that information structure should be incorporated to the mechanism of syntax-prosody mapping.

In Chapter 4, turning to the construction in (1.1b), the role of wh-intonation in the disambiguation of wh-scope is explored. Specifically, I investigate whether the widely accepted wh-island effects can be reconciled with prosodic and pragmatic factors. I hypothesize that matrix scope interpretation is not ungrammatical but rather disfavored in the structure due to unusual presuppositions which arise with the reading, and a marked prosodic pattern required for the interpretation. The results of production and comprehension tests exhibit that both the pragmatic context and prosodic factors play an important role. Here I argue that the account of prosodic and discourse factors needs to be integrated into an adequate account of the wh-island effect.

In Chapter 5, theoretical implications of the current study are discussed, and directions for future research are proposed.

CHAPTER 2

WH-INTONATION IN TOKYO JAPANESE, FUKUOKA JAPANESE, AND SOUTH KYEONGSANG KOREAN

2.1 Introduction

The prosodic marking of the semantic scope of wh-phrases observed in Tokyo Japanese (TJ) has recently attracted considerable attention, as its formation gives insight into the mapping process between syntax and prosody (Deguchi and Kitagawa 2002, Ishihara 2003, Kitagawa 2005a, Kubo 2005, Smith 2005). The prosodic pattern which marks wh-scope in TJ has been termed *Focus Intonation* (Ishihara 2003; 2004) or *Emphatic Prosody* (Kitagawa 2005). As implied by these terms, the prosodic contour observed in wh-interrogatives has been assumed to be equivalent to the prosodic encoding of contrastive focus (FOCUS) based on the similarities of the two intonation patterns. Recall that the intonation pattern induced by FOCUS exhibits F0 rise of the FOCUSed item and F0 compression or reduction of the post-FOCUS material (Pierrehumbert and Beckman 1988, Nagahara 1994, Sugahara 2003, among others). It has been widely accepted that FOCUS features are available to the prosodic structure at the syntax-prosody interface (Selkirk 1984, Truckenbrodt 1995, Zubizarreta 1998, Büring 2006, among others). If prosodic wh-scope marking is indeed a kind of FOCUS marking, the initiation of the prosodic pattern by the wh-phrase can be easily accounted for by assuming there is a FOCUS feature contained in the wh-phrase. This obviates the need for the [wh] feature to be accessible to the interface between prosody and syntax. However, this assumption does not hold for Fukuoka Japanese (FJ) and South Kyeongsang Korean (SKK), where the comparable correlation of

prosody and wh-scope is observed. In those two languages, wh-interrogatives and FOCUS exhibit distinct prosodic patterns. Thus, I use the term *wh-intonation* to refer to the prosodic encoding of wh-scope in these languages.

In considering the prosodic scope marking in pitch accent languages, none of the previous studies offers instrumental data to address the issues of the interaction between the accent of wh-phrases and wh-intonation. Additionally, cross-linguistic comparison is quite limited. Thus, the two main goals of this chapter are: first, to explicate the phonetic implementation of the prosodic scope marking with respect to pitch accents and, second, to generalize and propose a representation for the patterns of wh-intonation in the three languages. Specifically, the following questions are addressed. First, I examine how lexical accents surface inside the domain of wh-intonation by consulting prior work and by undertaking an experiment. Second, I consider the interaction between the accents of wh-phrases and the prosodic scope marking, focusing on the distinct patterns of wh-intonation in the languages under investigation. Third, based on the observed characteristics, I attempt to generalize and provide a representation for the prosodic marking of wh-scope. The careful study of the prosodic scope marking in this chapter reveals an important generalization about the nature of wh-intonation, offering implications for the interface of phonology and syntax. The data will also be the basis for considering issues involving constructions with greater complexity in the chapters that follow.

This chapter is structured as follows. I review the previous research on the prosodic marking of wh-scope in TJ (§2.2). Then, detailed phonetic descriptions of wh-intonation are provided for FJ (§2.3) and for SKK (§2.4). I provide instrumental data to test the issue of complete deaccenting, the

phonetic implementation of wh-intonation in SKK, based on a perception test in §2.5. Based on the observations in the previous sections, I provide some generalizations about the surface realization of wh-intonation in the three languages and propose a phonological representation in §2.6. I conclude the chapter in §2.7.

2.2 Wh-intonation in Tokyo Japanese

In this section, I introduce research on wh-intonation in TJ, which has been the most extensively studied among the languages at issue, at least in impressionistic terms. I first review two different accounts to define wh-intonation either as a domain of F0 compression (Deguchi and Kitagawa 2002, Ishihara 2002; 2003; 2004, Kitagawa and Deguchi 2002, Kitagawa 2005a, b) or as prosodic phrasing (Hirotani 2005), before discussing the issue of equating wh-intonation and FOCUS prosody.

Distinct intonational characteristics of wh and non-wh interrogatives in TJ were first recognized by Maekawa (1991). In comparing the F0 contours of wh and non-wh interrogatives, he observed that the F0 peak of a wh-phrase is higher than that of its non-wh counterpart, and that of the predicate is lower in wh-interrogatives. The test sentences and pitch contours of a wh and a non-wh interrogative produced by a male speaker of TJ in Maekawa (1991) are presented below.

(2.1) Wh and non-wh interrogatives tested in Maekawa (1991)

- | | | | |
|------------|----------------------------|-------------------|---------------------------|
| a. wh: | nani-ga
what-Nom | mieru?
be.seen | ‘What can (you) see?’ |
| b. non-wh: | nanika
something | mieru?
be.seen | ‘Can (you) see anything?’ |

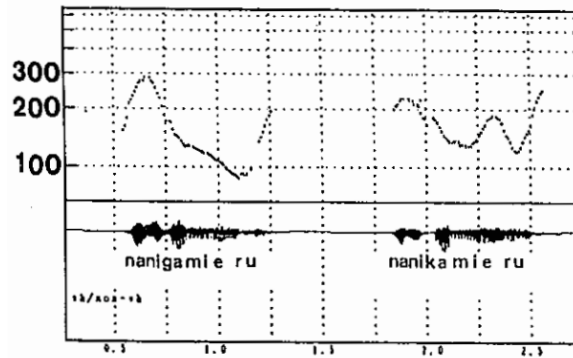


Figure 2.1. F0 contours of wh (left) and non-wh (right) questions in a logarithmic frequency scale (Maekawa 1991, p. 203)

Notice that the surface realization of wh-intonation in TJ is extremely similar to the intonation pattern induced by FOCUS which was discussed in §1.4. Based on these characteristics, Maekawa noted that, impressionistically, the focus of a wh-question is on the wh-phrase while that of a non-wh question is on the predicate. However, he did not capture the correlation between intonation and the scope of a wh-phrase as he tested only simple mono-clausal interrogatives.

Tomioka (1997) first captured the correlation between prosody and wh-scope. Also, Deguchi and Kitagawa (2002) and Ishihara (2002) independently reported that the right edge of the post-focal F0 compression correlates with the scope of a wh-phrase and they further documented the phenomenon (Ishihara 2003; 2004, Kitagawa 2005a, b; 2007). A representative example of wh-phrases taking distinct scope in TJ is given below, taken from Ishihara (2003). Wh-phrases and their semantic scope are represented by **boldface** and **shading**, respectively.

(2.2) A scopally ambiguous wh-interrogative in TJ (Ishihara 2003)

Naoya-wa [Mari-ga **nani-o** nomiya-de nonda-ka]
 Naoya-Top Mari-Nom what-Acc bar-Loc drank-Comp₂
 imademo oboeteru-ø?
 even.now remember-Comp₁

a. 'Does Naoya still remember what Mari drink at the bar?'

[CP₁ [CP₂ **wh** Comp₂] Comp₁]

b. 'What₁ does Naoya still remember whether Mari drank *t*₁ at the bar?'

[CP₁ [CP₂ **wh** Comp₂] Comp₁]

The embedded wh-phrase takes either embedded scope (2.2a) or matrix scope (2.2b), depending on which Comp it is associated with. Prosodically, the right edge of wh-intonation aligns with the right edge of the scope of the wh-phrase. Some speakers might not accept the matrix-scope reading in (2.2b), which violates the wh-island effect introduced in §1.2.2. Possible factors yielding the varying judgments on this construction are discussed in more detail in Chapter 4. Pitch contours of the two interpretations in (2.2), produced by Ishihara, are shown below. Arrows and shading indicate the location of wh-phrases and the domain of pitch compression, respectively.

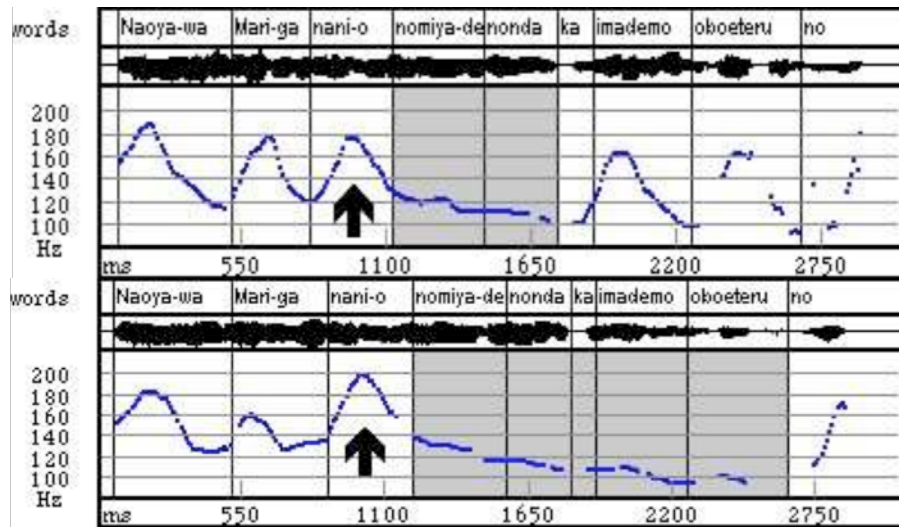


Figure 2.2. Pitch contours of the interrogatives with embedded (top) and matrix (bottom) wh-scope (Ishihara 2003, p. 61)

As shown in (2.2) and Figure 2.2, the two contours exhibit quite similar patterns until the Comp *ka*. Striking differences are observed in the F0 of the material following the embedded Comp where the compression is either terminated (in the top contour) or continued (in the bottom contour). Notice that the right edge of the domain of F0 compression aligns with the right edge of the wh-scope, indicating a correlation between the two. Observing this pattern, Deguchi and Kitagawa (2002) and Ishihara (2002, 2003) claim that wh-intonation in TJ corresponds to the domain of pitch compression. It should be noted that the realization observed in the post-wh material in TJ is F0 compression rather than deaccenting (Deguchi and Kitagawa 2002, Ishihara 2002, Hirotani 2005). Although this claim is lacking instrumental justification, it seems reasonable in that compressed accented words do exhibit initial lowering inside the domain of FOCUS (Sugahara 2003). Thus, wh-intonation in TJ is not a phenomenon of complete deaccenting, setting it apart from the implementation of wh-intonation observed in FJ and SKK.

While this view involving F0 compression adequately describes the observed prosodic pattern of wh-interrogatives in TJ, it cannot be readily extended to FJ and SKK where the comparable scope marking surfaces as the high flat pitch pattern. Further, it is unclear how discourse properties such as FOCUS or givenness interact with wh-intonation in TJ. Recall that, in the discussion regarding the prosodic effect of information status in §1.4, it is shown that F0 raising or compression can also be triggered by FOCUS or givenness (Selkirk 1995, Sugahara 2003, Selkirk 2007).

Turning to the phrasing account, Hirotani (2005) and Richard (2006) follow the tradition that FOCUS modifies phrasing rather than F0 excursion size (Nagahara 1994, Truckenbrodt 1995, Uechi 1998, Selkirk 2000). The prosodic scope marking in TJ can be well accounted for by this view involving phrasing manipulation. Also, this view has advantages over the F0 compression view in that it can be extended to describe a great number of languages where FOCUS is argued to modify prosodic phrasing (Kubo 2005, Richard 2006, and Smith, to appear, among others). Hirotani (2005) conducted a comprehension experiment designed to test the phrasing view in TJ and argued that wh-intonation manipulates phrasing, whereas F0 excursion size signals newness/givenness of the material. More precisely, Hirotani (2005) argued that wh-intonation in TJ corresponds to a Major Phrase (MaP) based on the claim that a MaP boundary is created on the left edge of FOCUS (Pierrehumbert and Beckman 1988). Though this view of MaP phrasing is attractive and claimed to be instrumentally tested, it is worthwhile looking closely at Hirotani's experiments since some questions arise regarding the methodology used and certain assumptions that were made.

The purpose of the comprehension test in Hirotani (2005) was to test

which cue—MaP boundaries or F0 compression—primarily disambiguates wh-scope. One test sentence and its four prosodic conditions are presented below. Parentheses and underlining indicate MaP boundaries and the domain of F0 compression, respectively. Since the pre-wh material is irrelevant in the prosodic conditions, subjects (*Yosimoto-san-wa*, *zyoosi-ga*) are omitted for ease of comparison.

(2.3) An example of the stimuli and the prosodic conditions (Hirotani 2005)

Yosimoto-san-wa zyoosi-ga **dare-o** syukkoosasete-ka
 Yosimoto-Mr-Top boss-Nom who-Acc transferred
 toiawasemasite-ka?
 inquired-Q

‘Did Mr. Yoshimoto inquire about whether the boss transferred?’

‘Who did Mr. Yoshimoto inquire about whether the boss transferred?’

a. Boundary, No F0 compression

(**dare-o** syukkoosasete-ka) (toiawasemasite-ka)?

b. Boundary, F0 compression on embedded verb

(**dare-o** syukkoosasete-ka) (toiawasemasite-ka)?

c. No Boundary, No F0 compression

(**dare-o** syukkoosasete-ka toiawasemasite-ka)?

d. No Boundary, F0 compression on verbs

(**dare-o** syukkoosasete-ka toiawasemasite-ka)?

Pitch contours of the prosodic conditions are shown below. All the stimuli in the test were recorded by Hirotani herself. Arrows and circles indicating wh-phrases and matrix verbs, respectively, were added by the author.

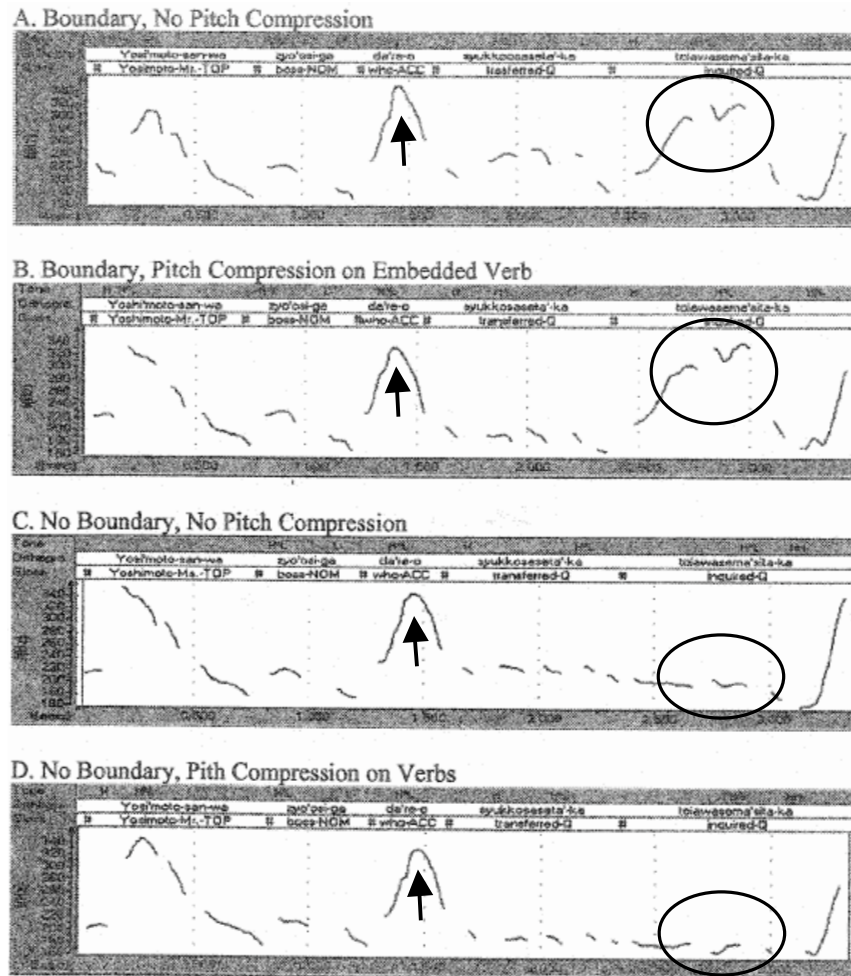


Figure 2.3. Pitch contours of the prosodic conditions tested in Hirotani (2005, p. 134)

It should be noted that the B and D conditions yield pitch contours typical of the embedded scope interpretation (B) and the matrix scope interpretation (D) presented in Figure 2.2. One question that arises here is: in what context do we observe the patterns of A and C? Though they might be naturally uttered in some specific discourse/situational context, Hirotani did not explicitly state the context in which the utterances were made. It is worth noting that discourse context must be carefully controlled, particularly in TJ, because F0 compression can signal not only wh-scope but also discourse status in this

variety of Japanese.

In comparing the four conditions above, recall that the critical part of scope disambiguation is the material following the embedded Comp *-ka*. As only a matrix verb appears after the Comp in the above example, the F0 of the matrix verb is expected to play a crucial role in the scope assignment. As shown above, the most noticeable differences among the four contours are indeed found on the F0 of the matrix verbs: it is not compressed in the ‘boundary’ conditions A and B, whereas it is substantially compressed in the ‘no boundary’ conditions C and D. Although condition C is labeled ‘no pitch compression’, the F0 of the matrix verb in C is obviously compressed compared to that of the contours in A and B. Thus, the B and C conditions should be labeled ‘boundary and *no pitch compression* on the matrix verb’, and ‘no boundary and *pitch compression* on the matrix verb’, respectively.

We now turn to the results of the comprehension test in Hirotani (2005), where subjects were asked to choose one of two possible responses, such as ‘yes, he did’ for an embedded scope or ‘a car’ for a matrix scope interpretation. Hirotani reported that, while the questions with the embedded scope prosody were interpreted as taking embedded scope (84%), the matrix scope prosody did not guarantee the subjects’ matrix scope interpretation (43%). It should be noted that the results from subjects who did not accept the matrix scope interpretation at all were included. Excluding those subjects, the results from forty subjects who accepted the matrix scope reading at least once are given below. (SD represents standard deviation.)

Table 2.1. Response of embedded reading in Hirotani (2005, p. 140)

	<i>Embedded Reading Response</i>	
	<i>Frequency (%)</i>	<i>SD</i>
A: Boundary, No Pitch Compression	86	24
B: Boundary, Pitch Compression	85	24
C: No Boundary, No Pitch Compression	63	27
D: No Boundary, Pitch Compression	54	30

As shown in Table 2.1, while the ‘Boundary’ conditions A and B exhibit higher percentages of the embedded response compared to the ‘No Boundary’ conditions C and D, F0 compression in B and D does not play a crucial role in disambiguating the wh-scope. However, A and B pattern together not only with respect to the presence of a boundary but also with respect to the pitch compression of the matrix verb. Thus, I believe that it is premature to conclude from these results that listeners primarily use the prosodic boundary cue and not F0 compression in resolving the ambiguity of wh-scope. Recall that a MaP is defined on the basis of F0 excursion sizes; the MaP is the domain of downstep (a.k.a. catathesis) and upward pitch resetting (Poser 1984, Pierrehumbert and Beckman 1988). Downstep is a lowering of pitch that follows the bitonal pitch accent H*+L. Upward pitch resetting at the left edge of a MaP brings the lowered pitch to a higher level signaling the onset of a new MaP. Though it seems fairly obvious from the results that some kind of phrasing is involved, these data alone are not sufficient to argue that a phrasing cue, excluding F0 compression, plays a primary role in disambiguating wh-scope.

The second issue worth discussing here is whether the level of phrasing involved is indeed a MaP. If this is the case, wh-phrases are expected to initiate a new MaP by resetting F0 without being downstepped. Yet,

Kubozono (2007) demonstrates that the F0 peak of wh-phrases after accented words undergoes downstep, indicating that wh-phrases do not necessarily trigger a new MaP. This result implies that it is necessary to assume another level of phrasing for wh-scope marking, which is larger than a Minor Phrase (MiP) but still influenced by the accentedness of the preceding material. This issue deserves further investigation.

Concerning the status of the prosodic scope marking, Hirotani (2005) argues that it is not a requirement, but only a preference. This argument was made based on the lack of preference for the matrix scope interpretation even with the matrix scope prosody. Note that Hirotani's claim is different from Ishihara's (2002, 2003) and Kitagawa and Deguchi's (2002) in that the semantic scope of wh-phrases obligatorily correlates with the intonation pattern according to them.

It should be noted that Hirotani assumed that a violation of the wh-island constraint is permissible in TJ. In an effort to include in her analysis only those subjects who accept the matrix scope interpretation, she calculated the percentages from the subjects who chose the matrix scope answer 'at least once'. Does the 'at least once' criterion truly indicate the acceptance of the matrix scope? I suspect that mistakes at the performance level, which are inevitable in behavioral data, were involved. Although she excluded subjects who did not accept the matrix reading even once, it might be the case that some speakers who normally obey the wh-island constraint mistakenly chose the answer for the matrix reading. The rather low percentages for the embedded reading in Table 2.1 (86%) also suggest that the subjects were not confident, or the prosodic patterns of the stimuli were confusing.

Perhaps more importantly, Hirotani (2005) assumed that there is no

wh-island effect with the Comp *-ka* discussed in §1.2.2, predicting that both scope interpretations are equally acceptable. She noted that there would be a strong bias for an embedded scope interpretation if a MaP boundary appeared after the embedded Comp. However, this assumption is not valid in that there is a strong bias towards embedded scope interpretation regardless of the presence of a MaP boundary; the unacceptability of/disfavor for the matrix scope reading has been extensively pointed out in the literature (Nishigauchi 1990, Watanabe 1992, Ishihara 2003, Kitagawa and Fodor 2003). Even for the speakers who accept the matrix scope interpretation violating the wh-island constraint, the matrix scope interpretation is disfavored. This issue will be taken up in §4.3. Thus, as also pointed out by Ishihara (2003), the lack of the expected preference for the embedded scope over the matrix scope reading for the prosodic condition C and D can be interpreted as the matrix-scope prosody having eliminated the bias towards the embedded scope reading, making both readings equally acceptable.

Despite the methodological issues and lack of careful considerations of syntactic preferences in Hirotsu (2005), however, the critical advantage of the phrasing view lies in the fact that it can be easily extended to explain similar phenomena in other languages from a representational point of view. Indeed, wh-intonation in FJ has recently been argued to be the formation of a single phrase (Kubo 2005, Richard 2006, Smith, to appear), a view which will be further discussed in the following section.

2.3 Wh-intonation in Fukuoka Japanese

2.3.1 Previous studies

FJ refers to the variety of Japanese which is spoken in the area

surrounding the city of Fukuoka, in the northwestern part of Kyushu. It is widely acknowledged that the overall prosodic system is largely similar to that of TJ in various aspects (Hayata 1985, Kubo 1989). Yet, for an investigation into prosodic scope marking, FJ appears to be particularly instructive since the pattern of prosodic scope marking in this variety of Japanese is specific to *wh*-intonation, independent of the encoding of information status. In this section, I introduce impressionistic descriptions and generalizations of *wh*-intonation in FJ primarily based on the work by Hayata (1985) and Kubo (1989 et seq.). Moreover, I discuss some observations revealing a recent change-in-progress with regard to the lack of accent loss among young speakers of FJ.

FJ exhibits prosodic scope marking of *wh*-scope similar to TJ, but with important differences. The prosodic scope marking in FJ was first described by Hayata (1985), and extensively examined in various constructions by Kubo (1989 et seq.). Kubo (1989) describes this intonation pattern as follows: a prosodic constituent is formed from a *wh*-element to the Comp that binds the *wh*-element. It consists of a rise during the *wh*-element followed by a high flat interval with a fall at the end. Further, the phonetic implementation of *wh*-intonation in this variety of Japanese is rather exceptional in that it has been claimed that lexically specified pitch accents are completely lost in the domain of *wh*-intonation. The only exception is a penultimate accent in an indirect *wh*-question (Hayata 1985, Kubo 1989, Smith 2005). Examples of a yes/no question, a direct and an indirect *wh*-question, taken from Kubo (1989), are given below.

(2.4) Example (Kubo 1989)

a. yes/no question

omae kyó-nen Kyóoto itta toya-ø
you last-year Kyoto went ending-Comp[-wh]

‘Did you go to Kyoto last year?’

b. direct wh-question

Dare-ga kyo-nen Kyooto itta toya-ø
Who-Nom last-year Kyoto went ending-Comp[+wh]

‘who went to Kyoto last year?’

c. indirect wh-question

Dare-ga kyooto ikú-ka wakar-án
Who-Nom Kyoto go-Comp[+wh] know-Neg

‘I don’t know who is going to Kyoto.’

According to Kubo (1989), it is predicted that the yes/no question in (2.4a) does not yield any special intonation pattern, exhibiting a pitch contour greatly resembling that in TJ. On the other hand, the wh-questions in (2.4b) and (2.4c) are expected to show a high flat pitch contour whose right edge is aligned either with the matrix Comp (2.4b) or with the embedded Comp (2.4c). Smith (2005) provides pitch contours for these examples, which are presented in Figure 2.4. Arrows added by the author indicate the domain of the high flat pattern.

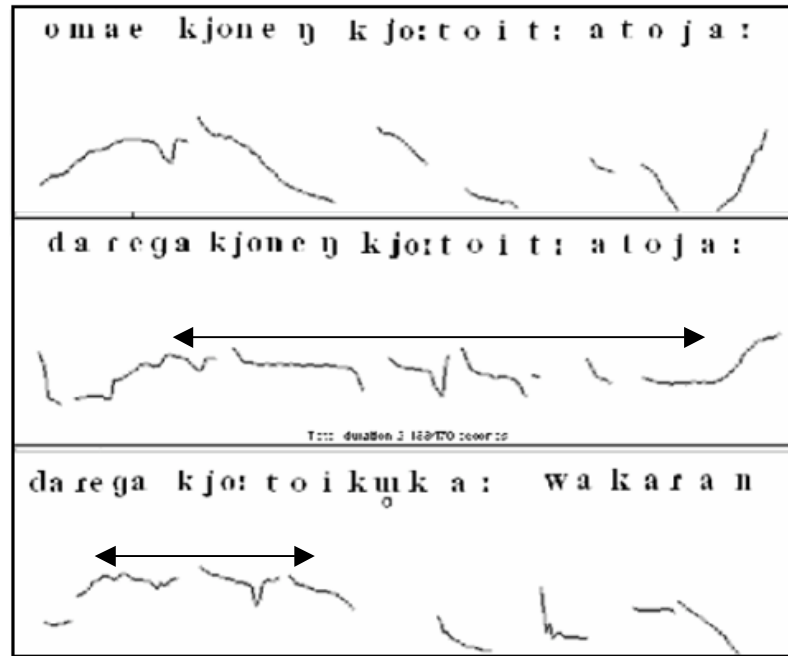


Figure 2.4. Pitch contours of a yes/no question (top), direct wh-question (middle), and indirect wh-question (bottom) in FJ (Smith 2005, pp. 222-223)

As the original examples contain voiceless consonants, local pitch perturbations are observed. Yet, as expected, Figure 2.4 illustrates an implementation of ordinary pitch accents for the yes/no question (top) and the high plateau pattern for the direct wh-question (middle). The abrupt F0 fall on the embedded Comp of the indirect wh-question (bottom) implies that a default accent is assigned to the penultimate mora of the embedded clause in (2.4c). Based on observations like these, Hayata (1985) and Kubo (1989) argue that the default tonal shape of wh-intonation is LH for direct wh-questions, and LH*L for indirect wh-questions.

Since wh-intonation is realized as a high plateau in this variety, there is no issue as to whether it is prosodic phrasing or F0 compression as in TJ. Instead, it is reasonably referred to as a prosodic phrase with a final boundary tone aligned with Comp where the relevant wh-phrase takes scope. Then,

what is the relevant level of phrasing? Recently, Kubo (2005) has proposed that wh-intonation in FJ is a single MiP based on the prosodic characteristics of wh-intonation in accordance with those of the MiP. Recall that a MiP is defined as the domain of initial lowering and it permits at most one accent, as reviewed in §1.3.2. The distinct level of prosodic phrase argued for wh-intonation in TJ and FJ—MaP for TJ and MiP for FJ—results from the language/dialect-specific implementation of prosodic scope marking. Thus, I believe that specifying the level of phrasing is not necessary. I will return to this issue in §2.6.

The most striking observation about wh-intonation in FJ is that no F0 rise or fall appears inside the domain of the high plateau, suggesting complete deaccenting. As we will see in later chapters, this exceptional characteristic in FJ is highly significant as it enables us to distinguish wh-intonation from the F0 rise or compression triggered by other discourse associated factors. However, only Smith (2007) tested this claim experimentally. She compared the F0 fall of both accented and unaccented items in either yes/no questions or wh-questions. The results showed that accented items in wh-questions (A-wh) pattern together with unaccented items (U) in terms of the average F0 fall, whereas accented items in yes/no questions (A-yes/no) exhibit a significantly greater F0 fall than items in the other conditions. These production data reveal that lexical pitch accents are entirely absent in the domain of wh-intonation.

(2.5) A-wh, U-wh, U-yes/no \ll A-yes/no

More importantly, notice that wh-intonation in FJ is distinct from post-FOCUS F0 compression which also signals discourse givenness. It is worth

reiterating that this high flat tonal contour which is specific to wh-intonation makes it possible to prosodically distinguish wh from other discourse/pragmatic patterns. Igarashi (2007) recently confirms this point experimentally in a production test where four FJ speakers in their early twenties were recorded. Overlapped pitch contours of a wh-question, a yes/no question with a FOCUSED accented word, and a yes/no question with a FOCUSED unaccented word are presented in Figure 2.5. The wh-phrase and the FOCUSED items are in the initial position of the interrogatives.

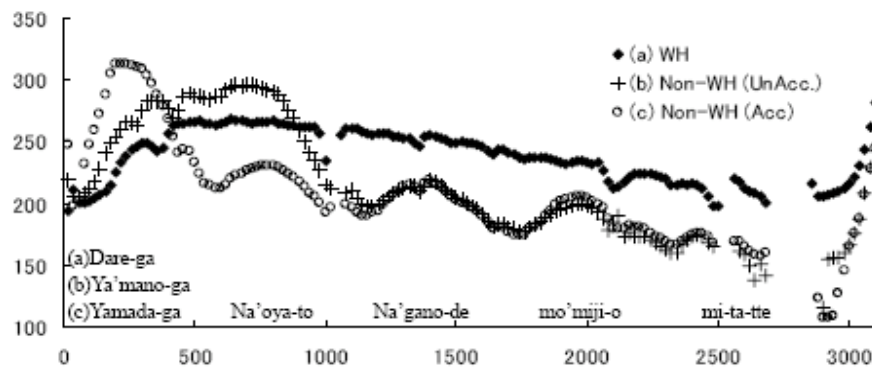


Figure 2.5. Pitch contours of a wh-question and yes/no questions with FOCUS in FJ produced by Speaker T (Igarashi 2007, p. 5)

The wh-question exhibits a high flat pitch contour with a gradual fall, presumably reflecting declination. In contrast, the yes/no questions involving FOCUS yield the expected F0 rise and F0 compression, without a sign of deaccenting.

It is worth noting that one of Igarashi's subjects (subject Y) does not exhibit the high plateau pattern for wh-interrogatives, as shown below.

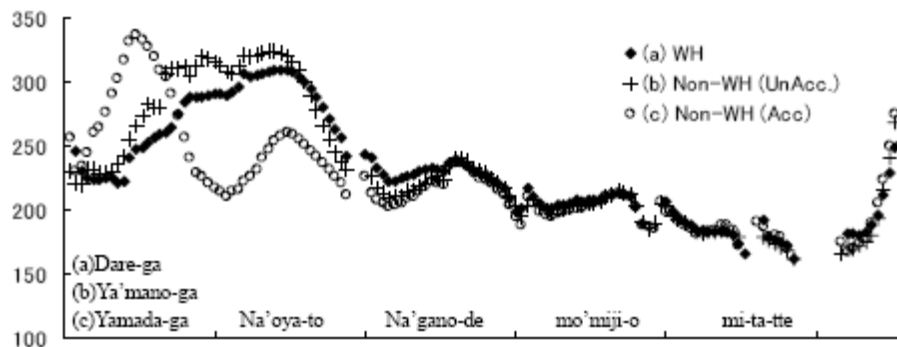


Figure 2.6. Pitch contours of a wh-question and yes/no questions with FOCUS in FJ produced by Speaker Y (Igarashi 2007, p. 5)

This speaker exhibits not the high plateau type, but F0 compression. Igarashi (2007) notes that the speaker exhibited both the high plateau and the F0 compression pattern for wh-interrogatives, suggesting variation—possibly a change in progress—in the prosodic pattern of the dialect, perhaps in the direction of a TJ-like standardization.

In the following section, I report further instability observed in the production test of the current study with younger FJ speakers.

2.3.2 Phonetic description of wh-intonation in Fukuoka Japanese

For the present study, college students ranging from 18 to 21 years old in age were recorded.¹ The phonetic descriptions reported here are somewhat preliminary in that the production test was not designed to address the issue of change-in-progress in this variety. Discrepancies were found in the recordings obtained in the production tests of Chapter 3 and Chapter 4 of the current study. The main discrepancy with the previous reports on the phonetic manifestation of wh-intonation was observed in the embedded verbs

¹ For detailed procedures of the recording, see the experimental methods sections in Chapter 3 and Chapter 4.

in indirect wh-interrogatives: there was neither accent deletion nor a default penultimate accent. Rather, embedded verbs maintained their lexical accents, exhibiting the requisite falling F0 tone following the accented mora. A representative example of indirect wh-questions recorded is presented below. The accented mora of the embedded verb is indicated by an acute accent mark.

- (2.6) keesatsu-wa [**dare**-ga sore-ba káttá-ka] sirabetoo-to?
 police-Top who-Nom it-Acc bought-Comp be.investigating-Comp
 ‘Are the police investigating whether who bought it?’

While wh-intonation in FJ is predicted to yield *kattá-ka* by assigning a penultimate accent for a word preceding an embedded Comp, the embedded verb in (2.6) demonstrates the lexically determined accent pattern (*káttá-ka*). A representative pitch contour of the above example is illustrated below. It was uttered by a female speaker of FJ (speaker FJF2) who consistently exhibited the high plateau type, not F0 compression.

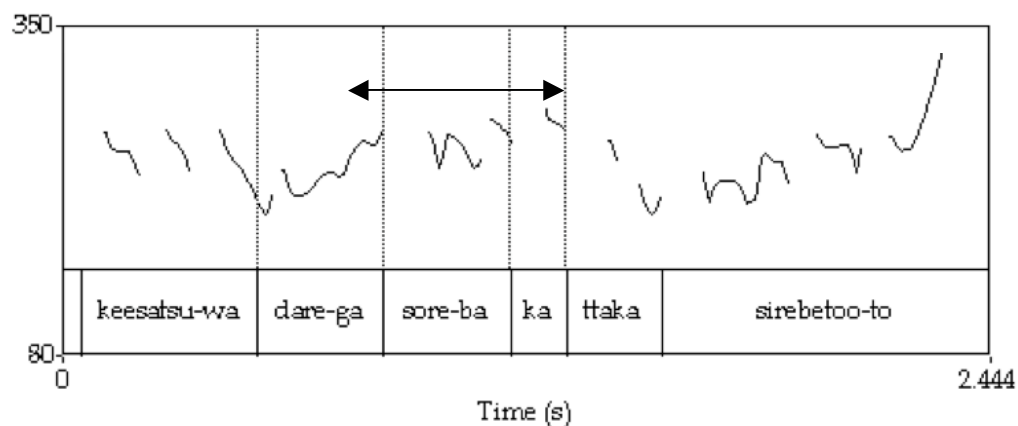


Figure 2.7. Pitch contour of an indirect wh-question in FJ

The high plateau terminates in the lexically accented mora (*ka-*) without stretching to the penultimate mora, suggesting a change of the high plateau pattern in FJ. This pattern was consistently observed in other verbs as well; as opposed to the expected *kakusitá-ka* and *attá-ka*, *kakúsita-ka* and *átta-ka* were observed, suggesting that the system is changing. This finding is in accord with the observation reported by Smith (1999) where a mora receiving accentuation alternated between a lexically accented mora and a penultimate mora when the Comp was *-kaina*. In the data tested here, however, the more general Comp *-ka* was involved, and the accentuation of a penultimate mora was entirely missing at least among young speakers of FJ. It might be the case that the young speakers of FJ were not willing to use their dialect with the experimenter who spoke in TJ, standard Japanese. Thus, further study with more extensive data is required to investigate this apparent change-in-progress or variation in wh-intonation by carefully controlling for broader sociolinguistic factors.

In the following section, we turn to wh-intonation in SKK, which is the most robust case.

2.4 Wh-intonation in South Kyeongsang Korean

2.4.1 Previous studies

Among the languages under discussion, the least attention has been paid to SKK with regards to wh-intonation. Gim (1970) first observes the particular pitch pattern in wh-interrogatives and impressionistically describes it as a tonal change of post-wh material. Specifically, he notes that all underlying tones following a wh-phrase change to H tones.

(2.7) Example from Gim (1970)

M H H H H H H H M
o tey ka-se kukes-ul sass-no
where go-and that-Acc bought-Comp
'Where did you go and buy that?'

Gim (1970) assumes that SKK is a tone language where three underlying tones H, M, and L are contrastive. Based on the observed pattern, he proposes a rule that the tonal contour of wh-questions becomes MH_nM where n is the number of syllables between the initial syllable of a wh-phrase and the question ending. However, he does not capture the nature of the 'tonal change', that is the prosodic scope marking, as he imposed no restrictions on the right edge of the process. Consequently, ill-formed intonation patterns are created for indirect wh-questions. Moreover, this rule is not sufficiently well-motivated. The exceptional prosodic pattern as an indication of wh-scope in SKK and the striking similarities with wh-intonation in FJ are first captured by Kubo (1993). In examining various interrogative constructions in SKK, Kubo also points out that there is no restriction in length for the high plateau. An example is presented below.

(2.8) Unrestricted length for the high plateau (Kubo 1993)

nwu-ka onul Chelswu-hako Yenghui-ka yekpwuro
who-Nom today Chelswu-and Yenghui-Nom on.purpose

Taykwu-ey kanta-ko ni-hanthey malhayss-no?
Taeku-Loc be.going-that you-to told-Comp

'Who told you that Chelswu and Yenghui are going to Taeku on purpose today?'

Although Kubo (1993, 2005) provides insightful observations on wh-intonation, an instrumental examination has yet to be done for this variety of Korean. Thus, I collected acoustic data for SKK in which minimal pairs (with respect to semantic scope) of wh-questions were recorded, carefully controlling for segmental context. Phonetic descriptions of wh-intonation in this variety of Korean are discussed in the following section.

2.4.2 Phonetic description of wh-intonation in South Kyeongsang Korean

Recordings were made using items which do not contain aspirated or tense obstruents. The recorded interrogatives and predicted domain of the high plateau are presented in (2.9).

(2.9) Interrogatives tested for prosodic scope marking in SKK

a. embedded scope

Minho-nun Yumi-ka	nwukwu-lul mannassnun-ci
Minho-Top Yumi-Nom	who-Acc met-Comp _[+wh]

kwungkumhayha-na?
wonder-Comp_[-wh]

‘Does Minho wonder who Yumi met?’

b. matrix scope

Minho-nun Yumi-ka	nwukwu-lul mannassnun-ci
Minho-Top Yumi-Nom	who-Acc met-Comp _[-wh]

kwungkumhayha-no?
wonder-Comp_[+wh]

‘Who₁ does Minho wonder whether Yumi met *t*₁?’

Recall that the final question endings *-na/-no* are morphological scope markers; *-na* for embedded scope and *-no* for matrix scope. Except for the final

question ending, the two sentences are identical at the segmental level. The pitch contours of the interrogatives above are presented in Figure 2.8 and in Figure 2.9. Both were uttered by a female speaker of SKK who was in her early twenties at the time of the recording. The high plateau and the falling boundary tone are indicated by arrows and circles, respectively.

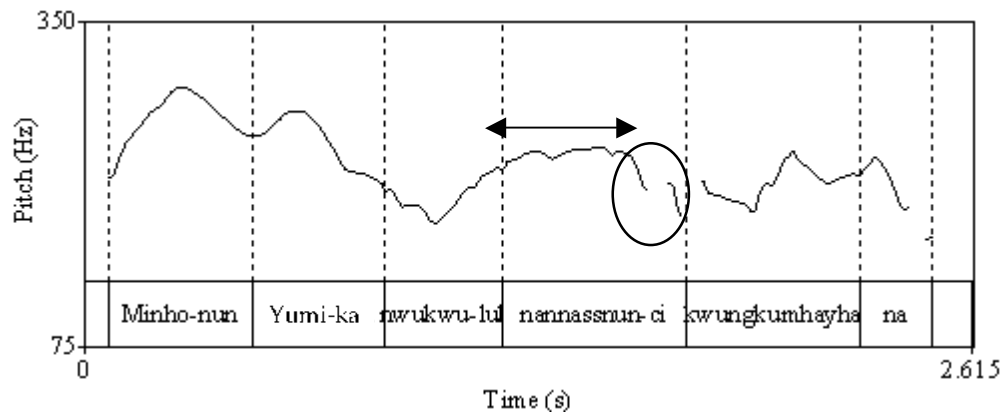


Figure 2.8. Wh-intonation of the high plateau pattern for an indirect wh-interrogative in SKK

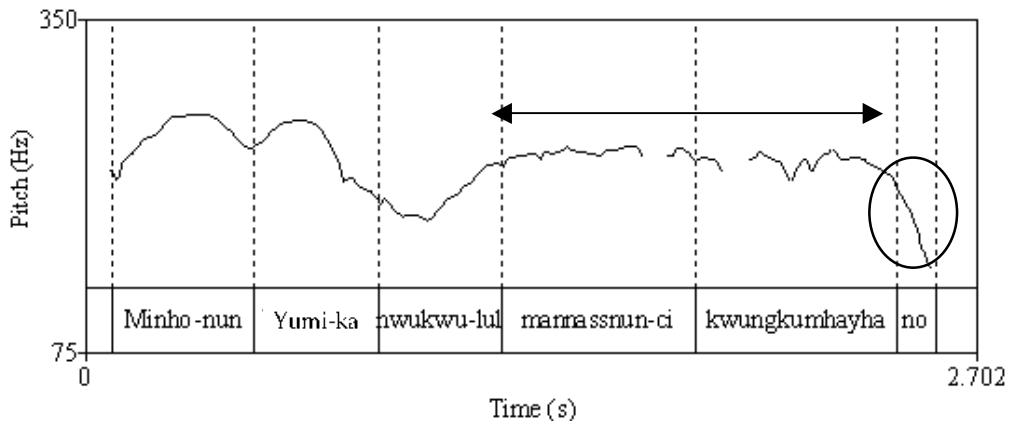


Figure 2.9. Wh-intonation of the high plateau pattern for a direct wh-interrogative in SKK

As graphically shown above, the right edge of the high flat F0 contour aligns with the Comp that the wh-phrase is associated with. Also, the right edge of

the high plateau is marked by a discrete falling tone regardless of wh-scope. Notice that up until the falling boundary tone on the embedded Comp in Figure 2.8, the overall pattern of the two contours is almost identical. This suggests that the initial cue that a listener encounters for disambiguation of wh-scope is the discrete falling boundary tone on the embedded Comp. Also, as in FJ, no clear sign of accent fall is observed inside the domain of wh-intonation. It should be noted that, unlike in FJ, no change in the location of accentuation is observed in SKK: the penultimate syllable (*mannassnúin-ci*), and not the lexically specified one (*mánnassnun-ci*), consistently receives accentuation.

In considering the phonetic implementation of prosodic scope marking in SKK, the following question arises: does the tone alternation of a wh-phrase influence the implementation of wh-intonation? The wh-phrases demonstrated above are realized with a rising tone as in FJ. Yet, recall that the interrogative words *nwukwu* ‘who’ and *myech* ‘how many’ in SKK bear alternating accent patterns LH(H)~HH(L). While Kubo (1993) notes that, intuitively, the falling accent pattern is emphatic, I found that both patterns can be used even in the same situation by a single speaker.² If these wh-phrases are produced with a falling tone, does the pitch rise again to form a high plateau? Or do we observe F0 compression following the falling tone? Pitch contours of the same wh-questions in Figure 2.8 and 2.9 where the wh-phrases exhibit a falling tone are presented below. These questions were produced by the same speaker who uttered the contours in Figure 2.8 and 2.9.

² There was a preference for one accent pattern over the other, the direction of preference depending on the speaker. Whereas two speakers among the four I recorded consistently used the rising pattern yielding the high plateau contour, the other two used the falling tone for *nwukwu* ‘who’ except for a few tokens.

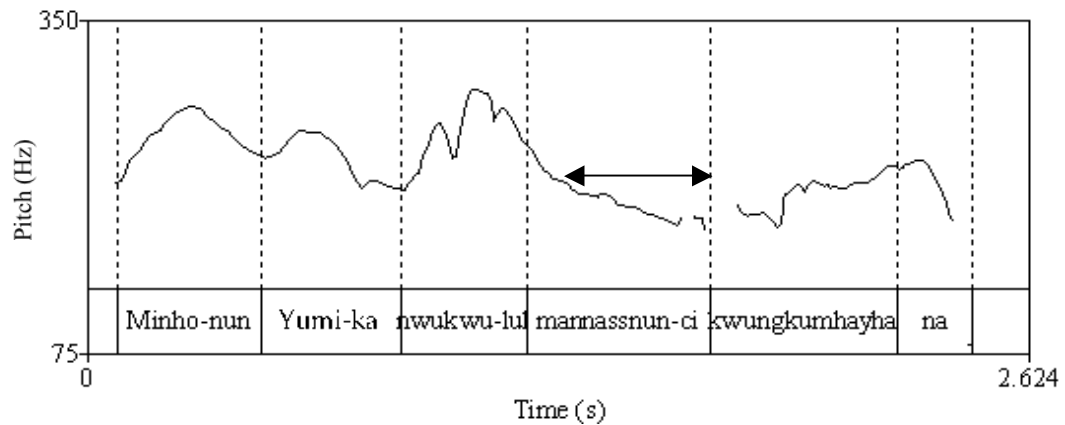


Figure 2.10. Wh-intonation of the F0 compression pattern for an indirect wh-interrogative in SKK

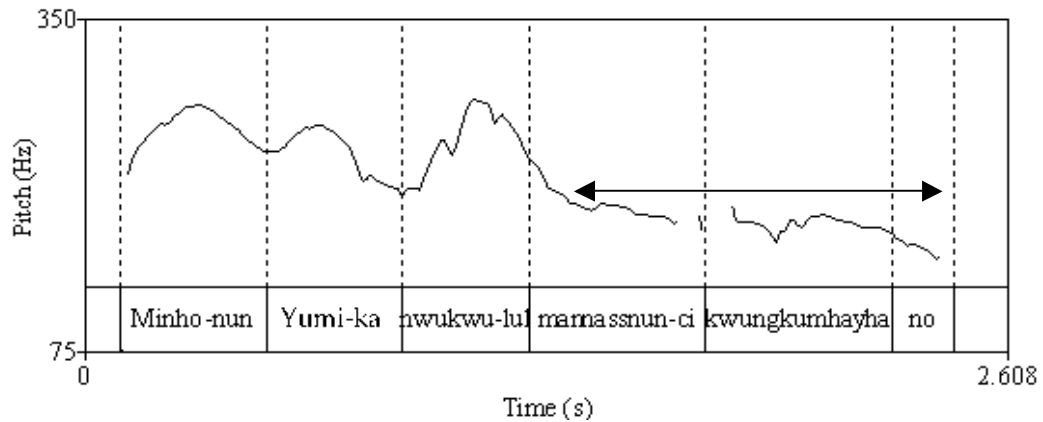


Figure 2.11. Wh-intonation of the F0 compression pattern for a direct wh-interrogative in SKK

Interestingly, if these interrogative words are uttered with a falling tone, F0 compression, and not the high plateau, results. In comparing the contours in Figure 2.10 and 2.11, notice that the difference is observed in the F0 peaks of the matrix verbs: the F0 peak of the matrix verb in the direct wh-interrogative in Figure 2.11 is substantially compressed. It should be noted that this pattern is comparable to the phonetic manifestation of wh-intonation in TJ. This finding suggests a generalization about the realization of wh-intonation: the implementation of prosodic scope marking is actually accent-dependent.

A similar kind of interaction between tone and intonation has been reported for the intonation pattern triggered by FOCUS in North Kyeongsang Korean (NKK); if an element bearing a falling tone is FOCUSed, the F0 of the element is raised and F0 compression follows on the post-FOCUS material. On the other hand, if a FOCUSed element bears a non-falling tone, F0 not of the FOCUSed element but of the following non-FOCUSed one is raised (Y. Chung 1991, Kenstowicz and Sohn 1997, H.S. Sohn 2004, and J.H. Jun et al. 2006, H.S. Lee 2008). This effect of tonal context on intonation is demonstrated in Figure 2.12, taken from H.S. Lee (2008). All tracks represent prosodic patterns of two-word sequences (W1-W2), where both words in (a, b) bear a falling tone but W1 and W2 in (c, d) bear a rising tone and a falling tone, respectively. Panels (a, c) show contours in a neutral context. In (b, d), either W1 (thin line) or W2 is FOCUSed (thick line).

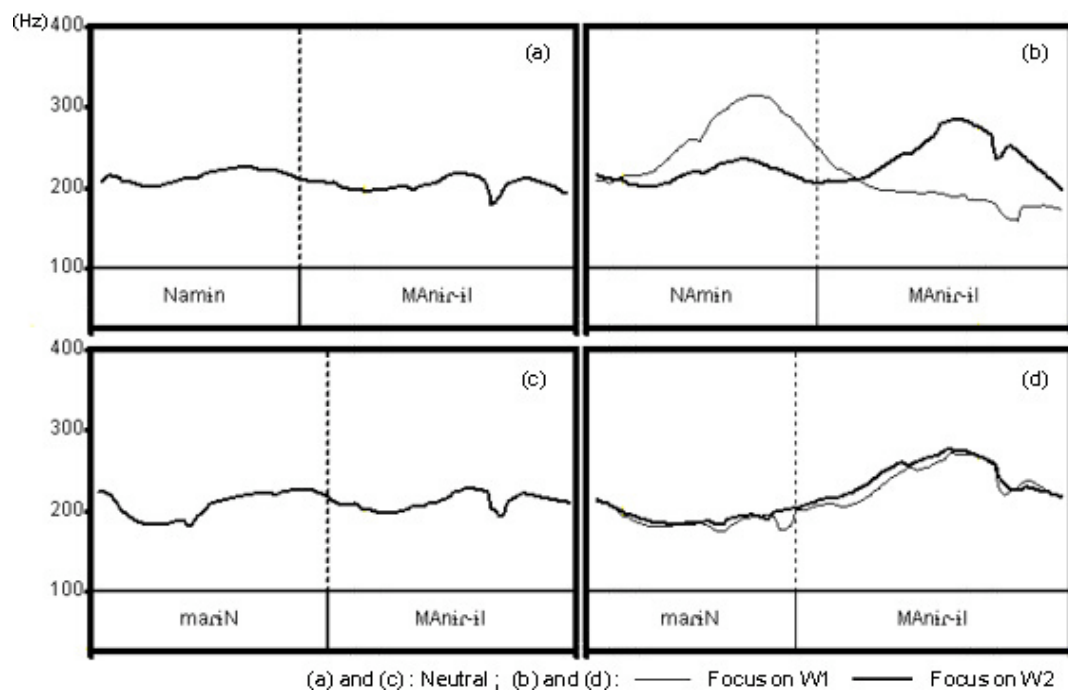


Figure 2.12. Tone-dependent FOCUS realization (H.S. Lee 2008, p. 114)

In comparing the contours in Figure 2.12 (a) and (b), it is clear that a FOCUSED element with a falling tone exhibits a raised F0 followed by F0 compression. If, on the other hand, a word bearing a rising tone is FOCUSED, as illustrated by the thin line in (d), it yields nearly the same prosodic pattern as the case where the word following it is FOCUSED, as presented by the thick line in (d). This asymmetrical FOCUS realization implies that distinct prosodic patterns that depend on tone type are not limited to the prosodic marking of wh-scope.

Having observed the tone-dependent phonetic implementation observed in SKK, we are now in a position to characterize the prosodic wh-scope marking in the three languages. Yet, the issue of deaccenting inside the wh-intonation span in SKK still remains to be instrumentally investigated. It is important to confirm this characteristic of the language because it enables us to prosodically discern prosodic wh-scope marking from the phonetic encoding of information status. Thus, I performed a perception test to investigate the claim of deaccenting in the domain of wh-intonation in SKK. The methodology of the perception test and implications of the results are discussed in the following section.

2.5 Perception test in South Kyeongsang Korean

In exploring prosodic scope marking in SKK parallel to that in FJ, Kubo (1993) claims that complete neutralization of tone contrast occurs inside the domain. As experimental data to support the claim have yet to be available, I conducted a perception test to ascertain whether total accent loss indeed occurs in SKK. In this section, I first present the stimuli and predictions of the test and then address the results and implications.

2.5.1 Stimuli and predictions

In evaluating the neutralization of tonal contrast, I employed two sets of tonal minimal pairs and three intonation patterns. The lexical accent types and the glosses of the two pairs are presented in Table 2.2.

Table 2.2. Tested tonal minimal pairs

	accent	gloss
mal	H(L)	horse
	R	speech
kan	H(H)	saltiness
	R	liver

Pitch contours for the pairs above, produced in isolation by a male speaker of SKK in his late twenties, are presented in Figure 2.13. The nominative marker *-i* follows as the tonal contrast is observed more clearly in this environment. The contours in each panel represent HL and R, respectively, for *mal* in the left panel, and HH and R for *kan* in the right panel. The short discontinuities in the left panel are caused by the lateral in the coda position as it undergoes intervocalic flapping.

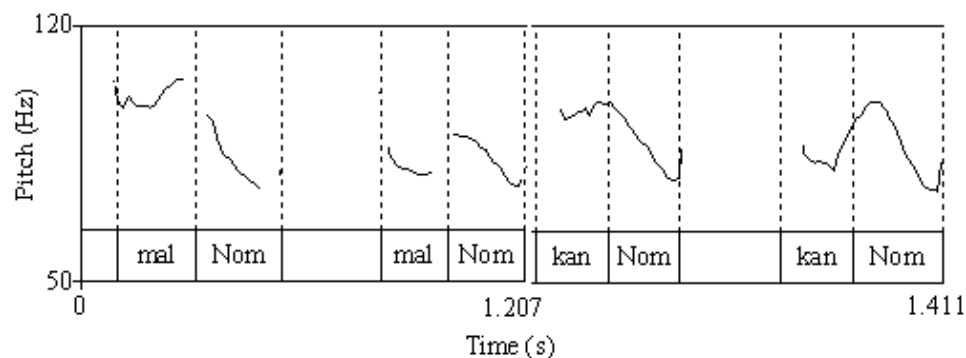


Figure 2.13. F0 contours of tonal minimal pairs followed by a nominative marker: HL-R for *mal* (left) and HH-R for *kan* (right)

The lefthand contours in each panel start at quite a high pitch. The one in the lefthand panel (HL) reaches its peak at the end of the first syllable and falls abruptly at the onset of the second syllable, whereas the one in the righthand panel (HH) displays an F0 peak that remains high until the beginning of the second syllable. Both contours in the right side of each panel exhibit a gentle rise toward the second syllable, reaching a peak in the second syllable followed by a falling tone.

Each item was embedded either in a declarative or in an indirect wh-interrogative. For the wh-interrogative, *nwukwu* ‘who’ was employed as it exhibits both types of wh-intonation. Wh-intonation with F0 compression and declaratives with no wh-intonation were included as a control group. The carrier sentences are given below with the target minimal pair underlined.

(2.10) Carrier sentences

- a. Nami-nun [Namho-ka mal-i te manhun-ci]
 Nami-Top Namho-Nom Target-Nom more plenty-Comp_[-wh]
 mwul-ess-ta
 ask-Past-Dec
 ‘Nami asked whether Namho is more talkative/ has more horses.’
- b. Nami-nun [nwu-ka mal-i te manhun-ci]
 Nami-Top who-Nom Target-Nom more plenty-Comp_[+wh]
 mwul-ess-ta
 ask-Past-Dec
 ‘Nami asked who is more talkative/ has more horses.’

Unlike declaratives (2.10a), indirect wh-questions (2.10b) are expected to exhibit either the high plateau pattern or F0 compression pattern, depending on the accent type of the wh-phrase. Notice that the target minimal pair is

located inside the domain of wh-scope in (2.10b). Thus, if wh-intonation is implemented as a high plateau, it is predicted that the tonal minimal pairs will lose their lexical accents and be completely neutralized. In contrast, in the domain of F0 compression, or in declaratives that do not yield wh-intonation, the tonal contrast of the target pairs will be preserved. Intonation patterns of carrier sentences and predictions are summarized in Table 2.3.

Table 2.3. Summary of prosodic conditions and predictions

	accent of wh	wh-intonation	prediction
declaratives		absent	contrastive
wh-interrogatives	HH(L)	compression	contrastive
	R	high plateau	neutralized

Two accent types of the target pairs, two tonal pairs, and three intonation types yielded twelve combinations ($2 \times 2 \times 3 = 12$). In testing the perception of the tonal contrast, each stimulus was used twice, so that a total of twenty four stimuli were presented to participants.

2.5.2 Recording

Two (one male and one female) native speakers of SKK participated in the recordings. They were born and raised in the South Kyeongsang region (in the city of Changwon for the male subject and in the city of Jinju for the female subject). The male and female speakers were twenty-eight and twenty-one years old, respectively, at the time of recording.

The recordings were conducted in a quiet location at one of the subjects' home. A portable Marantz digital recorder (PMD 660) and a SHURE SM 57 microphone were used for the recordings. A script was given to each

subject that contained test sentences in Korean orthography. Situations that facilitate each reading of the minimal pairs were not included in the script. Instead, I provided the context for each test sentence verbally. Subjects were instructed to listen carefully to the context given, and to read the test sentence accordingly. Each speaker read the script twice at a comfortable speed. The second renditions were used as the stimuli for the perception test as they were more naturally uttered. For wh-questions, both speakers consistently produced the wh-phrase with a rising tone, resulting in the high plateau pattern. As it was also necessary to obtain wh-intonation of the F0 compression pattern, I asked them to utter the wh-phrase with a falling tone after confirming that it is natural for both of them. As expected, the falling tone of the wh-phrase yielded not the high plateau but the F0 compression pattern for prosodic wh-scope marking. At the recording session, a total of twenty four (12 stimulus type \times 2 speakers) stimuli were created.

2.5.3 Procedure

Twelve (seven male and five female) native speakers of SKK in their twenties or early thirties participated in the perception test. All were born and grew up in the South Kyeongsang region.

The stimuli were randomized and presented in the same order to all participants. The choices were presented in a text. Participants were asked to double-click on the sound icon of each stimulus, and they were allowed to listen to each stimulus twice. It was a forced-choice test, so the participants had to pick one of the two choices. Categories or synonyms for each meaning were given as choices to distinguish the homophones: *mal* ‘horse’ and *mal* ‘speech’ were discriminated by the labels ‘animal’ and ‘language’,

respectively. For *kan*, ‘liver’ and ‘saltiness’ were discriminated by the labels ‘organ’ and ‘seasoning’, respectively. The perception test was conducted either in a quiet classroom or in an office at Changwon National University.

2.5.4 Results

A total of 288 responses were collected (24 stimuli × 12 participants). Overall, subjects clearly distinguished the tonal minimal pairs when the test words appeared either with no wh-intonation or with the compression type following an accented wh-phrase. The absence of wh-intonation (in declaratives) and F0 compression conditions yielded 93.8% and 89.6% accuracy, respectively. The average percentages of correct responses are graphically presented in Figure 2.14.

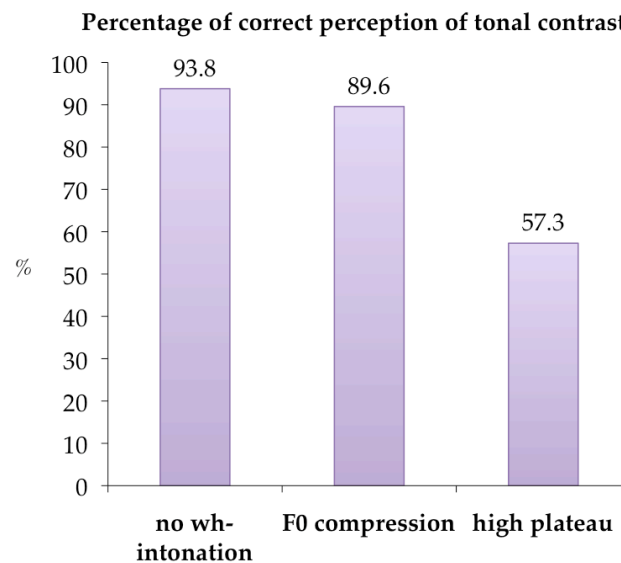


Figure 2.14. Mean percentages of correct perception of tonal contrast depending on intonation patterns for all listeners

This high level of accuracy when wh-intonation is absent is not surprising as

different accent patterns are clearly present in declaratives. Wh-intonation of F0 compression yielded a slightly lower rate of accuracy than the condition lacking wh-intonation. This suggests that compressed F0 contours provide rather weak cues for tonal contrast, though the overall effect on perception was minimal. In contrast, considerable confusion is observed with the high plateau pattern, yielding a rate barely above chance for correctly distinguishing the minimal pairs. A one way ANOVA test confirms that the high plateau pattern yields significantly lower percentage of correct perception compared to the other conditions ($F(2,21)=14.6401$, $p<.0001^*$). As the lexically specified tonal contrast fails to be perceived in the domain of the high plateau, I conclude that the tonal distinction is neutralized when the wh-intonation of the high plateau overrides it.

Given these observations, in the following section I propose some generalizations about the patterns of prosodic scope marking in the three languages and propose phonological representations to account for these patterns.

2.6 Typological generalizations about the prosodic wh-scope marking

In this section, I first attempt to provide a generalization about the prosodic scope marking observed in the languages under investigation; I then consider the phonological representations of the particular prosodic patterns by integrating the phonetic data presented in the previous sections.

As shown in the previous sections, the phonetic realization of wh-intonation is determined by the accent of the accompanying wh-phrases. Recall that wh-intonation surfaces as F0 compression in TJ, where wh-phrases bear a falling tone, whereas it surfaces as a high plateau in FJ, where wh-

phrases exhibit a rising tone in wh-interrogatives.³ The accent alternation of particular wh-phrases in SKK sheds further light on the striking effect of tonal type on the implementation of wh-intonation. Moreover, theoretically, this observation indicates that the information of a wh-phrase and its accents must be available at the interface of syntax and prosody.

Also, integrating the characteristics of wh-intonation in the languages suggests that prosodic scope marking in question modifies phonological phrasing, requiring a wh-phrase and its associated Comp to be contained in a single prosodic phrase. The view accounting for wh-intonation in TJ as local F0 compression alone does not capture the global effect of the intonation patterns and, further, it is difficult to extend this analysis into the closely related languages. I conclude that this type of prosodic scope marking modifies phonological phrasing, following Hirotsu (2005) and Richard (2006). The modification of phrasing surfaces as local F0 compression in certain languages and as a high plateau in others. Yet, without specifying its level, I refer to the phrase formed for marking wh-scope as a phonological phrase, as the phonetic implementation of wh-intonation is distinct among the languages.⁴

Given the typological generalizations above, I would like to propose phonological representations for the tone-determined prosodic scope marking in the languages under examination. Representations for the two patterns are given in (2.11). Phrase boundaries are indicated by parentheses. A falling tone is represented as H*+L following the representation of accented items in TJ.

³ Kubo (1989) notes that wh-phrases in FJ exhibit a falling tone in isolation as they do in TJ but are realized with a rising tone in wh-questions.

⁴ Ito and Mester (2007) propose that a MaP and a MiP are the same prosodic category used in a recursive structure.

Also, the trailing tone of a rising accent is considered to be a phrasal tone marked by +H. I proposed that wh-intonation is formed by interpolating the phrasal tone of a wh-phrase and a corresponding phrasal tone on the relevant Comp.

- (2.11) a. (H)H*+L L-
 (wh Comp_[+wh])
 b. L(H)+H H-
 (wh Comp_[+wh])

Utterance-final tones are not represented in (2.11). Recall that a rising boundary tone (H%) is observed both for TJ (Figure 2.2) and FJ (Figure 2.5). On the other hand, unlike Seoul Korean (S.A. Jun 2000) or TJ (Venditti 1997), there is no interrogative-final rising tone in SKK. This suggests that boundary tones are not required for the implementation of wh-intonation. Instead, it seems that they are dependent on the final question particle. Hayata (1985) observes that FJ exhibits a final rising tone with Comps such as *-ya*, *-na*, and *-to* as also apparent in Figure 2.5. Yet, a final falling tone is observed with the Comps *-ka* and *-kaina* in FJ.

I further propose that phonetic modification can occur by manipulating F0 excursion size, reflecting information status at the discourse level, as also proposed by Hirotsu (2005). Sugahara (2003) convincingly shows that when a post-FOCUS XP is discourse-new, a MaP is present at the left edge of the XP. Although she did not test wh-intonation, the result is informative as FOCUS and wh exhibit similar prosodic patterns in TJ. The results of Sugahara's experiment are summarized in (2.12).

(2.12) The effect of context on phrasing (Sugahara 2003)

a. post-FOCUS material is discourse-new

FOCUS	New	New
(MaP)(MaP)(MaP)
(MiP)(MiP)(MiP)

b. post-FOCUS material is discourse-given

FOCUS	Given	Given
(MaP)
(MiP)(MiP)(MiP)

As can be seen from the pattern of MiPs above, the test words were all accented. Notice that the discourse-new material following FOCUS initiates a MaP, which is contrary to the conclusion that FOCUS deletes all following MaP boundaries reported in previous research where information status was not considered (Pierrehumbert and Beckman 1988, Nagahara 1994). This F0 modification according to information status is also relevant to the issue of the domain of wh-intonation when long-distance scrambling (LD-scrambling) is involved, a topic that is taken up in Chapter 3.

In considering the interaction of wh and FOCUS, FOCUS seems to override wh-intonation in SKK. That is, the high plateau is terminated when FOCUS is encountered inside the wh-domain, and an F0 rise and compression are observed (Kubo 1993, Hwang 2006). For FJ, however, Kubo (p.c.) observes that the high plateau pattern is preserved even when FOCUS is assigned inside the domain. More detailed examination is required for the issue of the interaction between wh and FOCUS.

2.7 Conclusion

In this chapter, I have reviewed previous research and issues regarding the prosodic marking of the semantic scope of wh-phrases in TJ, FJ and SKK. In particular, this chapter notably expands and solidifies the discussion of the phenomenon with experimental data on the phonetic implementation of wh-intonation in FJ and SKK.

The prosodic marking of wh-scope in the languages under investigation comprises a special prosodic contour that forms a phonological phrase corresponding to the scope of a wh-phrase. Its left edge is aligned with the wh-phrase, and its right edge is aligned with the Comp, over which the wh-phrase takes scope. It implies that the information of wh-phrases should be accessible to the interface between prosody and syntax. Also, there is no way to identify the domain of wh-intonation as a syntactic constituent.

In FJ and SKK, the phonetic encoding of wh-intonation and FOCUS is distinct. The prosodic marking of wh-scope in these dialects exhibits a high flat F0 contour with lexical pitch accent deletion occurring for all of the material inside the domain. Impressionistic observations of deaccenting in SKK receives experimental support from the results of a perception test, which reveals that lexical pitch accents are not contrastive inside the domain of the high plateau.

In TJ, wh-intonation exhibits the F0 excursion expansion of a wh-phrase and the F0 compression of the post-wh material. Studies solely on TJ assume that the prosodic pattern of wh-interrogatives and the prosody invoked by FOCUS are equivalent based on the phonetic similarity between the two. Yet, the exceptional implementation of wh-intonation in SKK and FJ highlights the fact that FOCUS intonation and the intonation pattern of wh-interrogatives in

those languages are distinct.

Though the high plateau pattern is dominant for prosodic scope marking in SKK, some wh-phrases exhibit alternating tone patterns resulting in distinct realizations of wh-intonation. This observation corroborates the correlation between the accent types of wh-phrases and the phonetic implementation of wh-intonation: a rising tone of a wh-phrase yields the high plateau pattern with a neutralization of tonal contrast, whereas a falling tone results in the F0 compression pattern for scope marking.

Given the observations addressed in this chapter, I proposed typological generalizations and phonological representations for the type of prosodic scope marking in question. In the next chapter, we turn our attention to prosodic scope marking in constructions involving LD-scrambling, where a wh-phrase is not located inside the domain corresponding to its semantic scope.

CHAPTER 3

LONG-DISTANCE SCRAMBLING AND INFORMATION STRUCTURE¹

3.1 Introduction

In this chapter, I address the puzzle regarding the domain of prosodic scope marking in the context involving long-distance scrambling (henceforth, LD-scrambling). As an LD-scrambled wh-phrase is placed outside the domain corresponding to its semantic scope, constructions with wh-LD-scrambling are instructive cases for obtaining a better understanding of the interface between scope and prosody, and for testing the mapping of syntax and prosody.

Yet, contradictory facts have been reported regarding the domain of wh-intonation in LD-scrambling contexts in TJ. In this chapter, in order to resolve the issue, I take information structure seriously into account as both wh-intonation and information status are prosodically encoded as the expansion or compression of F0 excursion size in TJ. Also, FJ and SKK are included in the discussion as these languages exhibit a correlation between the semantic scope of wh-phrases and prosody comparable to wh-intonation in TJ. Further, unlike in TJ, the phonetic implementation is unique to wh-intonation in these languages. These characteristics make it possible for wh-intonation in these languages to be distinguished from the manipulation of F0 excursion size triggered by other discourse-associated factors. The experimental results

¹ This chapter represents an updated and extended version of the approach to wh-intonation in constructions of LD-scrambling in Hwang (2006) where only the information status of FOCUS and givenness was tested excluding newness. A later version was presented at the Workshop on Interface-based Approaches to Information Structure held in London, UK in September 2008, and will appear in Neeleman, A. and I. Kucerova (eds.), *Information Structure: Contrasts and Positions*, Cambridge University Press.

show that the correlation between *wh*-scope and prosody holds even for *wh*-interrogatives with LD-scrambling.

Scrambling describes a process of deriving non-canonical word order in languages which exhibit relatively free word order such as German, Hindi, Turkish, Japanese and Korean. While it has been widely accepted that scrambling is an optional and semantically vacuous operation (Ross 1967, Saito 1985; 1989, Fukui 1993, K.S. Nam 2001, among others), there is no consensus regarding what drives scrambling in Japanese and Korean.² Scrambling occurs either clause-internally or across clause boundaries. The latter is usually referred to as LD-scrambling. LD-scrambling describes a situation where an embedded element scrambles beyond clause boundaries and occupies a position in the matrix clause. Semantically, however, it has been claimed since Saito (1989) that an LD-scrambled element undergoes ‘radical reconstruction’ and is interpreted as if the scrambling has been undone, that is, as if the scrambled element is still *in situ*.³ The configuration of LD-scrambling and examples taken from Saito (1989) are given in (3.1). (Syntactic subjects are abbreviated as ‘Sub’. Subscripted *m* or *e* indicates matrix or embedded material, respectively.)

² Recently, there has been an attempt to account for scrambling in Japanese and Korean as a kind of movement: short scrambling driven by the ETT feature on T and LD-scrambling driven by focus (Miyagawa 2001). See also Bošković and Takahashi (1998) and Cho and Kim (2000) for a base-generation approach.

³ Takahashi (1993) claims that there is a semantic effect with LD-scrambling; the scrambled *wh* must take matrix scope in interrogatives. However, Aoshima et al. (2003) show that the embedded scope reading is preferred when the provided context is biased in favor of such an interpretation.

- (3.1) **wh-phrase** [_{CP_m} Sub_m [_{CP_e} *t*_{wh} Comp_[+wh]]]
- a. [Mary-ga [John-ga **dono** hon-o tosyokan-kara
Mary-Nom John-Nom **which** book-Acc library-from
karidasita-ka] siritagatteiru] (koto)
checked.out-Comp_[+wh] want.to.know fact
- b. ? **dono** hon-o [Mary-ga [John-ga *t* tosyokan-kara
 which book-Acc Mary-Nom John-Nom library-from
karidasita-ka] siritagatteiru] (koto)
checked.out-Comp_[+wh] want.to.know fact

The canonical order of indirect *wh*-questions is shown in (3.1a), while the embedded element *dono hon-o* ‘which book’ occupies the initial position in the matrix clause in (3.1b), a position which is out of its semantic scope. The LD-scrambling of a *wh*-phrase that takes embedded scope has been judged by some as unacceptable (Takahashi 1993 for TJ, Kubo, p.c. for FJ), or somewhat degraded (Saito 1989 for TJ, C.M. Suh 1987 for SKK) as indicated by a question mark in (3.1b). Yet, various previous studies regarding the LD-scrambling of *wh*-phrases taking embedded scope and the naïve speakers consulted there find the structure fully acceptable (Kitagawa and Deguchi 2002, Aoshima et al. 2003, Miyagawa 2005, H.J. Hwang 2007). This construction is particularly enlightening because LD-scrambling of a *wh*-phrase involves discord between the surface position of the *wh*-phrase (matrix clause) and its semantic scope (embedded clause). Thus, discerning the domain of *wh*-intonation in this structure contributes knowledge that is relevant for approaching a more fundamental understanding of the prosodic scope marking. The debate regarding the domain of *wh*-intonation in this structure is introduced in the following section.

3.1.1 The puzzle

While there is consensus regarding the domain of *wh*-intonation in indirect *wh*-questions without LD-scrambling, different claims have been made for the domain of *wh*-intonation in the LD-scrambling constructions. The contradictory claims are illustrated in (3.2) below. Capital ‘V’ represents a verb and the shaded portions of the schemata indicate the domain of *wh*-intonation.

(3.2) a. Ishihara (2002), Kitagawa and Deguchi (2002)

wh [CP_m Sub_m [CP_e *t*_{wh} V_e-Comp_[+wh]] V_m]

b. Ishihara (2004, 2005): mismatch

wh [CP_m Sub_m [CP_e *t*_{wh} V_e-Comp_[+wh]] V_m]

As shown in (3.2a), Ishihara (2002), and Kitagawa and Deguchi (2002) claim that F0 compression terminates with the embedded Comp, based on impressionistic observations. Yet, the description in this work is quite limited, as it was not tested by an acoustic study where F0 contours are carefully examined taking downstep and/or declination into consideration. On the other hand, Ishihara (2004, 2005) proposes a Multiple Spell-Out model (henceforth MSO), a cyclic derivation based on the syntactic domain of the *phase* in the Minimalist framework (Chomsky 2000; 2001). MSO, in Ishihara’s interpretation, predicts that F0 compression continues to the end of the matrix clause as in (3.2b) with the subordinated scope interpretation. According to Ishihara (2004, 2005), his experimental results support this interpretation. The claim is important in two respects: first, it was based on a systematic instrumental study. Second, if the results are correct, the scope-intonation

correlation is no longer observed in wh-LD-scrambling contexts, which is the reason that Ishihara refers to the constructions involving LD-scrambling as the ‘mismatch’ case. However, he acknowledges that the intonation pattern in (3.2a) is also possible in a footnote in Ishihara (2004) as follows.

In fact, I still feel that (38a) (= 3.2a above, H.K. Hwang) is not entirely impossible. (...) If, however, this intuition turns out to be real, there must be some additional mechanism that allows a contour like (38a) (= 3.2a above, H.K. Hwang), because the Multiple Spell-Out model would never allow such a contour (p. 113, footnote 27).

In order to resolve the empirical question, I have incorporated into my experiment sets of sentences similar to those in Ishihara’s (2004, 2005) study. For purposes of comparison, not only TJ but also SKK and FJ were included, and the sentences were tested in various contexts. I argue on the basis of the experimental results reported here that the domain of wh-intonation in the construction can be identified precisely once information structure is taken into account, and the prosodic manifestation due to other aspects of information context is distinguished from wh-intonation. We see that the nature of prosodic scope marking can be better understood when we explore the expanded list of languages as presented in this study. This approach provides an effective testing ground for the syntax-prosody mapping in these languages.

The experimental results described below show that the scope-prosody correlation is indeed maintained even in the LD-scrambling constructions, as

claimed by Ishihara (2002), and Kitagawa and Deguchi (2002). However, the intonation pattern in (3.2b) also turns out to be possible when the post-subordinate clause material is discourse-given. In order to motivate the new approach adopted here, in the remainder of this section, I review the previous studies on *wh*-scope marking in LD-scrambling constructions in §3.1.2, before turning to the methods and the results of these experiments.

3.1.2 Previous studies

Until recently, not much attention had been paid to the domain of *wh*-intonation in constructions with LD-scrambling. As noted above, Ishihara (2002) and Kitagawa and Deguchi (2002) assert that the domain of *wh*-intonation stops with the embedded *Comp*, based on impressionistic observations. Although this assertion was not tested by systematic experiments, it is worthwhile to examine the model that Kitagawa (2005a, b) developed, which is based on Kitagawa and Deguchi (2002). To account for the scope-prosody correlation, they introduce a syntactic analysis relying on the operation *Agree* (Chomsky 2000). The features that Kitagawa assumes undergo *Agree* are given below. Italics and capitals are marked as in the original source.

(3.3) Features on *wh* and focused phrases (Kitagawa 2005b)

- a. **WH-P** – Focus *Wh*-phrase
- b. **Wh-P** – Non-focus *Wh*-phrase
- c. **FP** – *Non-wh focus* phrase (both presentational and contrastive)
- d. **Wh** – Reference to *Wh*-in general as in “*Wh*-questions, *Wh*-phrase, *Wh*-in-situ”

The scope of *WH*-Ps, *Wh*-Ps and *FP*s is determined when each of them is associated with a specific formal feature on *Comp*, as summarized in (3.4).

(3.4) Features on *Comp* (Kitagawa 2005b)

- a. *COMP* [*wh*]: *COMP* with a **wh**-feature (= an interrogative feature) is *unselectively* associated with one or more *wh*-Ps.
- b. *COMP* [*F*]: *COMP* with an **F**-feature (= an emphatic feature) is associated with an *FP*.
- c. *COMP* [*WH*]: *COMP* with a **WH**-feature (= an interrogative emphatic feature)

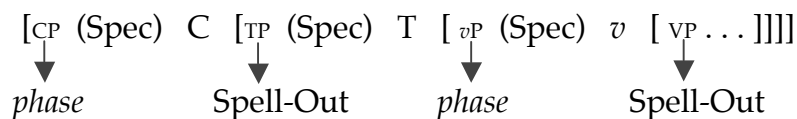
While *WH*-P appears on *wh*-phrases which exhibit *wh*-intonation, *Wh*-P appears on *wh*-phrases nested inside another *wh*-intonation domain. Recall that the *F0* of post-*wh* material is compressed in *TJ*. Thus, *Wh*-P is not prosodically prominent. However, Agree alone does not derive the right prosodic pattern for the structure under examination as an LD-scrambled *wh*-phrase escape the government domain of its head. Thus, Kitagawa and Deguchi (2002) propose another process called ‘linear scanning’, which will be further discussed in §5.2.1. Also, it is not clear what the motivations are for the three different ‘*wh*’ features—*WH*-P, *Wh*-P and *Wh*, and whether the ‘focus’ in *WH*-P and *Wh*-P involves both presentational and contrastive focus as *FP* does. Note that what is discussed as ‘focus’ in the prosodic literature is in fact typically *FOCUS*, and a *wh*-phrase is not always contrastively focused in the way that *FOCUS* refers to the case which has a limited set of alternatives as discussed in §1.4. Further, it appears that Kitagawa does not differentiate *wh*-intonation from *FOCUS* intonation; this assumption cannot be extended to

other languages such as FJ or SKK where the prosody of *wh*-phrases and non-*wh* FOCUSED phrases is distinct. Recall that this issue was addressed in §2.3 and §2.4. The same limitation—that is, equating the prosodic *wh*-scope marking and FOCUS intonation—is present in Ishihara’s work (2004, 2005).

Ishihara (2003, 2004, and 2005) proposes a model based on a cyclic derivation of prosody for *wh*-scope marking. The idea behind this proposal is that *wh*-scope marking is not a result of the direct phonology-semantics interaction but triggered by a *phase-by-phase* syntactic derivation (Ishihara 2004). The fundamental insight of this account is that *wh*-intonation is assigned from a *wh*-phrase to the right edge of some Spell-Out domain. A *phase* is a subpart of a derivation of a clause the internal elements of which are inert to a grammatical interaction such as feature checking with external elements. It is characterized in semantic terms as “the closest syntactic counterpart to a proposition” (Chomsky 2000). After a *phase* is constructed, the complement of the phase head is available to the phonology via Spell-Out. Let us consider *phases* and the approach to Spell-Out as adopted by Ishihara from Chomsky (2001a, b).

(3.5) Phrase and Multiple Spell-Out (Chomsky 2001a, b)

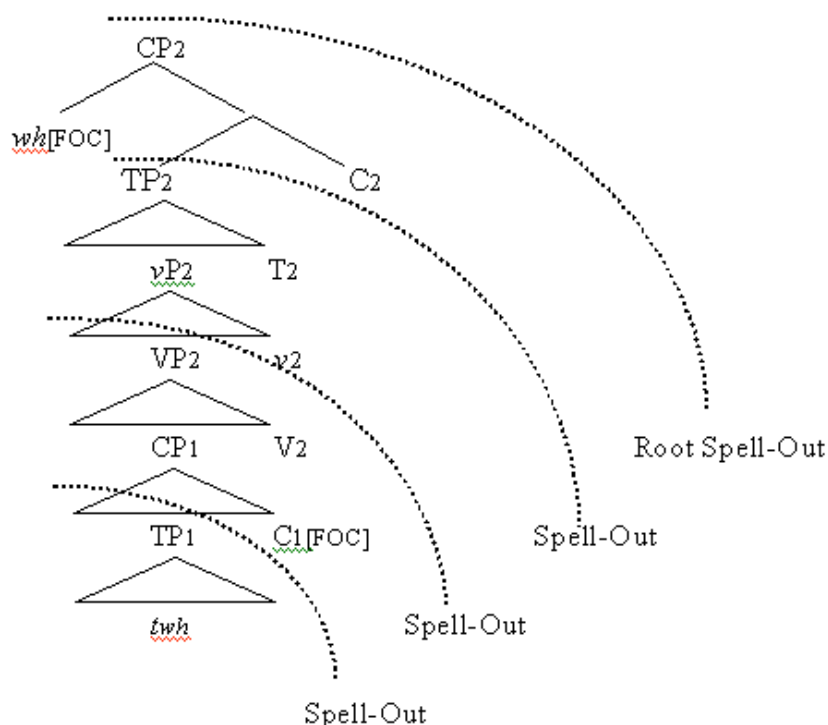
- a. CPs and *v*Ps are *phases*.
- b. When a syntactic derivation reaches a *phase* (CP/*v*P) in the syntax, the complement of the *phase* head (TP/VP) is transferred to the interface levels. The phonological part of the Transfer is called Spell-Out.



Two focus features are assumed; one on a Q-particle (FOC_Q), the other on a wh-phrase (FOC_{WH}). After the two features establish an Agree relation, FOC_{WH} enters into the interface level. At each Spell-Out domain, FOC_{WH} found at the interface level triggers generation of wh-intonation, ending at the right edge of the Spell-Out domain. Note that Comp itself is outside the Spell-Out domain as TP, not CP, undergoes Spell-Out. In order to include Comp in the wh-intonation domain, Ishihara suggests that it is phonologically cliticized to the preceding phrase.

Let us now turn to the prediction of MSO for the LD-scrambling constructions. The relevant simplified tree structure is displayed below. Successive scrambling of the wh-phrase and detailed structure are omitted for the sake of brevity.

(3.6) Prediction of MSO for LD-scrambling constructions



Following Mahajan (1994) and Miyagawa (1997), Ishihara assumes that the landing site of LD-scrambling is [Spec, CP] and the wh-phrase moves cyclically (Spec *v*P₁ → Spec CP₁ → Spec *v*P₂ → Spec CP₂).⁴ As a result, at each cycle of Spell-Out, the wh-phrase escapes from the domain by cyclic movement. Thus wh-intonation is not created even at the CP₂ phase. To assign wh-intonation in this construction, MSO assumes an additional process, called Root Spell-Out. It requires the entire matrix CP (CP₂) be sent to Spell-Out at the last stage of the derivation. As a result, in the case of LD-scrambling, the entire clause including the wh-phrase is sent to Spell-Out, and wh-intonation is generated. Notice that wh-intonation would not be generated without Root Spell-Out.

Further pursuing experimental evidence for the model, Ishihara (2004, 2005) tested four types of sentences whose structures are shown below.

(3.7) Configurations of four sentence types tested

- a) [Sub_m [Sub_e DP V_e-Comp] target V_m]
- b) [Sub_m [Sub_e **wh** V_e-Comp] target V_m]
- c) [DP Sub_m [Sub_e *t*_{DP} V_e-Comp] target V_m]
- d) [**wh** Sub_m [Sub_e *t*_{wh} V_e-Comp] target V_m]

(3.7a) and (3.7b) are declaratives with canonical order, where a DP or a wh-phrase is the object of the embedded clause. The embedded object—DP or wh—is LD-scrambled in (3.7c) and (3.7d), respectively. The target phrase immediately follows the embedded clause. What Ishihara measures are the

⁴ There is an alternative account in which all scrambled phrases adjoin to TP. See Saito (1989) for detailed discussion on the issue.

peak F0s of the embedded verb (V_e) and the target phrase. Based on the statistically significant difference between the peak F0s of DP-scrambled and wh-scrambled constructions (3.7c) and (3.7d), Ishihara concludes that wh-intonation in (3.7d) continues to the matrix material to the right of the scrambled wh-phrase in wh-LD-scrambling constructions.

These results were interpreted based on instrumental data, yet the differences among speakers cast doubt on Ishihara's claim: Among four speakers, only one speaker (YY) exhibited significantly lower F0 of the target phrase in the wh-scrambled condition compared to the other three conditions. For speakers CS and KS, the F0 difference between DP and wh-scrambled conditions was not significant. Speaker AH exhibited quite interesting results; the target phrase in that speaker's wh-scrambled sentences yielded lower F0 values compared to DP-scrambled cases. Yet, the F0 peaks of the target phrase in the wh-in-situ condition were also lower than those in the DP embedded conditions. Given the inter-speaker differences and lack of consistency, the empirical basis for Ishihara's claim seems somewhat limited. Possible factors which may have induced these differences are discussed later in this chapter.

Perhaps even more importantly, Ishihara does not take into account the possible effects of contextual information in his test sentences, even though contextual information is extremely crucial particularly in TJ, since an F0 rise or compression may be triggered by discourse information such as FOCUS or givenness (Sugahara 2003, Kubozono 2007), as shown in Chapter 2. However, when it comes to the distinction between wh-intonation and FOCUS intonation, none of the previous literature on this issue has differentiated the two.

Further, Ishihara's particular MSO approach faces the limitation that it

cannot be extended to SKK and FJ, which exhibit similar prosodic scope marking in *wh*-interrogatives. If the prediction made by Ishihara's version of the MSO approach for the LD-scrambling construction were correct, there would be a high plateau all the way to the end of a matrix clause independent of the embedded semantic scope, in SKK and FJ. Yet, this is not the case in either SKK or FJ (Kubo 2005,⁵ Hwang 2006). This indicates that although Ishihara's MSO approach is successful in predicting the domain of *wh*-intonation in *wh*-interrogatives without LD-scrambling, a new approach is necessary which can fully account for the data incorporating the observed cross-linguistic variation in this regard.

The remainder of this chapter is structured as follows. In §3.2, I present the procedures of data collection, measurements and analyses. In §3.3, I provide the experimental results which indicate that the right edge of the prosodic *wh*-scope marking in an LD-scrambling context aligns with the embedded Comp. In §3.4, after proposing an explanation attempting to account for the discrepancy between the results of Ishihara's study and those of the current experiment (§3.4.1), I discuss the effect of discourse structure on prosody (§3.4.2). I conclude this chapter in §3.5.

3.2 Experimental methods: testing the *wh*-intonation of long-distance scrambling in Tokyo Japanese, Fukuoka Japanese, and South Kyeongsang Korean

3.2.1 Materials

In order to examine the domain of *wh*-intonation when *wh*-LD-

⁵ LD-scrambling of a *wh*-phrase that takes embedded scope is judged to be ungrammatical in FJ according to Kubo (2005). However, the FJ speakers in my test found the construction acceptable, though somewhat degraded.

scrambling has occurred, two object types (DP *vs.* wh-phrase) and two object positions (embedded *vs.* LD-scrambled) were tested in TJ, FJ, and SKK. This was done to replicate and extend the data from Ishihara (2004, 2005) by putting the same types of sentences in different contexts, as discussed above. The structures of the four types of target sentences are repeated in (3.8).

- (3.8) a) [Sub_m [Sub_e DP V_e-Comp] I.O. V_m-Q]
 b) [Sub_m [Sub_e **wh** V_e-Comp] I.O. V_m-Q]
 c) [DP Sub_m [Sub_e *t*_{DP} V_e-Comp] I.O. V_m-Q]
 d) [**wh** Sub_m [Sub_e *t*_{wh} V_e-Comp] I.O. V_m-Q]

All four types are affirmative sentences with embedded yes/no or wh-questions. (3.8a) and (3.8b) are sentences with canonical word order (DP/wh embedded). The DP and the wh-phrase are LD-scrambled in (3.8c) and (3.8d), respectively (DP/wh scrambled). The target phrases, which are indirect objects (I.O.) immediately following the embedded clauses, are indicated by underlining. Unlike the material tested by Ishihara (2004, 2005) and Hwang (2006), the adverb *imademo* ‘still’ was not used, due to its focal reading. Three different sets were tested, varying the embedded verbs: ‘eat’, ‘read’ and ‘make’ for SKK, ‘drink’, ‘read’ and ‘knit’ for Japanese. These verbs were selected in consideration of segmental context and word frequency. Only accented words were used, as in Ishihara’s experiment. Also, accented items are expected to exhibit accent deletion inside the wh-intonation domain in SKK and FJ, and different behavior between accented and unaccented words has been reported in TJ (Pierrehumbert and Beckman 1988, Kubozono 1989, Sugahara 2003).

Each sentence was preceded by a question in a dialogue with different information structure. One set of dialogues where a wh-phrase is embedded in the target sentence in each language is listed in (3.9). A complete list of the test dialogues appears in Appendix A.

(3.9) Example dialogues with varying context

a) TJ

- FOCUS

Experimenter: Ryoo-wa nande sonnani Yumi-ni kyoomi-ga
 Ryoo-Top why so Yumi-Dat interest-Nom
 aru-no? Yumi-ga nani-o yonda-ka
 is-Q Yumi-Nom what-Acc read-Comp
 Yumi-no oneechan-ni kiite-mita-tte?
 Yumi-Gen sister-Dat ask-tried-Q

‘Why is Ryoo so interested in Yumi? He asked
 Yumi’s sister what Yumi read, right?’

Speaker: uuung, Yumi-no oneechan jyanakute...
 No, Yumi-Gen sister is.not

Ryoo-wa Yumi-ga **nani-o** yonda-ka
 Ryoo-Top Yumi-Nom what-Acc read-Comp

Naoya-ni kiite-mita-tte
 Naoya-Dat ask-tried-Quot

‘No, it’s not Yumi’s sister. I heard that Ryoo asked
 Naoya what Yumi read.’

- New

Experimenter: Ryoo-wa nani-o sita-tte?
 Ryoo-Top what-Acc did-Quot

‘You said Ryoo did what?’

Speaker: Ryoo-wa Yumi-ga **nani-o** yonda-ka
 Ryoo-Top Yumi-Nom what-Acc read-Comp

Naoya-ni kiite-mita-tte
Naoya-Dat ask-tried-Quot

'I heard that Ryoo asked Naoya what Yumi read.'

- Given

Experimenter: Ryoo-wa Naoya-ni nani-o kiite-mita-tte?
Ryoo-Top Naoya-Dat what-Acc ask-tried-Q

'Do you know what Ryoo asked Naoya?'

Speaker: Ryoo-wa Yumi-ga **nani-o** yonda-ka
Ryoo-Top Yumi-Nom what-Acc read-Comp

Naoya-ni kiite-mita-tte
Naoya-Dat ask-tried-Quot

'I heard that Ryoo asked Naoya what Yumi read.'

b) FJ

- FOCUS

Experimenter: Ryoo-wa nande sonnani Yumi-ni kyoomi-ga
Ryoo-Top why so Yumi-Dat interest-Nom

aru-to? Yumi-ga nan-ba yonda-ka
is-Q Yumi-Nom what-Acc read-Comp

Yumi-no oneechan-ni kiite-mita-tte?
Yumi-Gen sister-Dat ask-tried-Q

'Why is Ryoo so interested in Yumi? He asked
Yumi's sister what Yumi read, right?'

Speaker: uuung, Yumi-no oneechan jyanakute...
No, Yumi-Gen sister is.not

Ryoo-wa Yumi-ga **nan-ba** yonda-ka
Ryoo-Top Yumi-Nom what-Acc read-Comp

Naoya-ni kiite-mita-tte
Naoya-Dat ask-tried-Quot

'No, it's not Yumi's sister. I heard that Ryoo asked
Naoya what Yumi read.'

- New

Experimenter: Ryoo-wa nan-ba sita-tte?
Ryoo-Top what-Acc did-Quot

‘You said Ryoo did what?’

Speaker: Ryoo-wa Yumi-ga **nan**-ba yonda-ka
Ryoo-Top Yumi-Nom what-Acc read-Comp

Naoya-ni kiite-mita-tte
Naoya-Dat ask-tried-Quot

‘I heard that Ryoo asked Naoya what Yumi read.’

- Given

Experimenter: Ryoo-wa Naoya-ni nan-ba kiite-mita-tte?
Ryoo-Top Naoya-Dat what-Acc ask-tried-Q

‘Do you know what Ryoo asked Naoya?’

Speaker: Ryoo-wa Yumi-ga **nan**-ba yonda-ka
Ryoo-Top Yumi-Nom what-Acc read-Comp

Naoya-ni kiite-mita-tte
Naoya-Dat ask-tried-Quot

‘I heard that Ryoo asked Naoya what Yumi read.’

c) SKK

- FOCUS

Experimenter: Yengwu-nun way kulehkey Yumi-hantey kwansim-i
Yengwu-Top why so Yumi-Dat interest-Nom

manh-no? Yumi-ka me-lul ilkessnun-ci
plenty-Q Yumi-Nom what-Acc read-Comp

Yumi unni-hantey mwule-pwassta-mye?
Yumi sister-Dat ask-tried-Q

‘Why is Yengwu so interested in Yumi? He asked
Yumi’s sister what Yumi read, right?’

Speaker: uuung, Yumi unni-ka aniko...
No, Yumi sister-Nom is.not

Yengwu -nun Yumi-ka **me**-lul ilkessnun-ci
Yengwu -Top Yumi-Nom what-Acc read-Comp

Minho-hantey mwule-pwassta-nta
Minho-Dat ask-tried-Quot

'No, it's not Yumi's sister. I heard that Yengwu asked
Minho what Yumi read.'

- New

Experimenter: Yengwu-nun me-lul hayssta-ko?
Yengwu-Top what did-Quot

'You said Yengwu did what?'

Speaker: Yengwu-nun Yumi-ka **me**-lul ilkessnun-ci
Yengwu-Top Yumi-Nom what-Acc read-Comp

Minho-hantey mwule-pwassta-nta
Minho-Dat ask-tried-Quot

'I heard that Yengwu asked Minho what Yumi read.'

- Given

Experimenter: Yengwu-nun Minho-hantey me-lul mwule-pwassta-no?
Yengwu-Top Minho-Dat what ask-tried-Q

'Do you know what Yengwu asked Minho?'

Speaker: Yengwu-nun Yumi-ka **me**-lul ilkessnun-ci
Yengwu-Top Yumi-Nom what-Acc read-Comp

Minho-hantey mwule-pwassta-nta
Minho-Dat ask-tried-Quot

'I heard that Yengwu asked Minho what Yumi read.'

Note that the lexical content of the target sentence uttered by the speaker is identical across the contexts. Varying discourse contexts provided by the experimenter's questions results in the assignment of distinct information-structural properties to the target phrase. In the FOCUS context, as the experimenter asks a question with an incorrect indirect object, FOCUS is

expected to be assigned on the indirect object in correcting the information in the question. While the indirect object is discourse-new in the New context, it is given information in the Given context.

3.2.2 Participants and recording

Three female and three male speakers of each language participated in the recording. They ranged in age from 20 to 33 years at the time of recording. All were born and grew up in the respective linguistic target areas and had no history of speech or hearing impairment.

Recordings were made in a sound-attenuated booth at Cornell University for TJ, at Smyrna church in the city of Changwon for SKK, and at Kyushu University in the city of Fukuoka for FJ. A portable Marantz digital recorder (PMD 660) and a SHURE SM 57 microphone were used for the recordings.

I briefed the speakers on the procedure for the recording. Since the target materials were embedded in a dialogue, they were informed that I would ask a question, and that they would answer the question by reading the given materials written in Korean or Japanese orthography. The experimenter's questions (*i.e.* contexts) were not included in the written scripts, so that they had to pay attention to the questions uttered by the experimenter. An effort was made by me, the experimenter, to produce the context-providing questions consistently. Subjects were instructed to give natural renditions at a comfortable speed. Practice time was given in order to eliminate unnaturalness. When the speakers misread the materials or inserted unnatural pauses, they were asked to repeat the sentence before proceeding to the next one. It should be noted that it was quite a difficult task for speakers as

they had to understand the context thoroughly and perform as if they were in the situation implied by the dialogue. At the beginning, speakers read nearly every phrase with a predetermined prosodic pattern regardless of context, as reported in other studies where different contexts were tested (Gussenhoven 1983). In order to solve the difficulty, I asked comprehension questions regarding the situations like what the questioner is misunderstanding, what she wants to know, what her question was, and so on. Through being asked such questions, speakers realized that they should pay attention to the context. In fact, speakers asked for the questions to be repeated frequently during the practice time and occasionally when they missed the context in later repetitions. Also, instead of producing my side of the dialogue with a 'reading' intonation, I 'performed' the test material so as to encourage speakers to produce natural utterances.

A total of four repetitions were elicited from each speaker, and a short break was given between the repetitions. The recording session for each speaker lasted approximately one hour including practice time and the breaks. All speakers were paid for their participation at the end of the recording session.⁶

3.2.3 Measurements and analyses

The data were digitized at a 22,050 Hz sampling rate and 16-bit quantization. Labeling and measurements were made using Praat version 5.0.03. Only three out of the four repetitions were analyzed. In most cases, the second, third and fourth repetitions were used unless their quality was

⁶ The data collection was funded by a Research Travel Grant from the Cornell Graduate School.

substantially low due to disfluencies, unnaturalness, or background noise. Also, when an outlier F0 value was present in one of the later repetitions due to consonantal perturbations, the first repetition was used instead.

Phrase boundaries were manually marked on each utterance. In measuring fundamental frequencies, both peak and valley F0 values of each phrase were extracted in order to discern the best reference point. The labeling and measurements are illustrated in Figure 3.1.

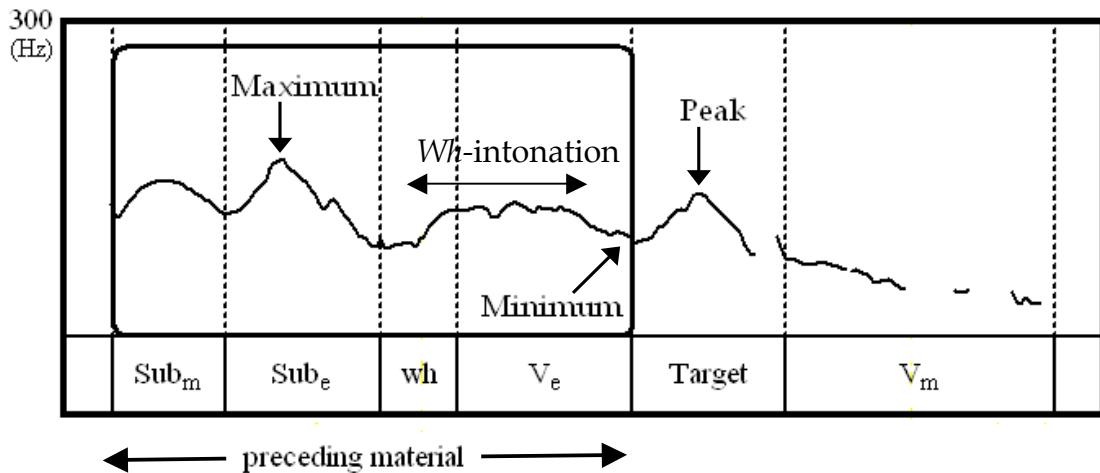


Figure 3.1. Annotation and measurements of a sample token (uttered by SKK Speaker M2)

The token shown in Figure 3.1 is a *wh*-embedded type uttered in the discourse-new context by a male speaker of SKK. Recall that discourse-new refers to a context where the *wh*-question has not been asked in prior discourse (Lambrecht 1994, Féry 2007, among others). Although there are some bumps, the high flat pitch pattern is observed from the end of the embedded *wh*-phrase to the syllable preceding the Comp. While the F0 peak of the target phrase is the primary concern of this study, pitch patterns of the material preceding the target were also examined. Since the pitch range of

even a single speaker can vary from token to token, comparing only the absolute F0 peak values without considering a reference point can be misleading. Yet, it is a non-trivial problem to factor out the pitch range variation.

To circumvent the possibility of distortion introduced by normalization, the reference point was chosen using the following procedure. From the peak and valley F0 values of the preceding material, maximum F0, minimum F0 and F0 range of the preceding material were obtained. In the preceding material, maximum F0s were detected in the embedded subject for the constructions with canonical word order. For DP-scrambled constructions, the F0 peaks of the scrambled DPs were the F0 maxima. Minimum F0 values were observed at the end of the embedded Comp for all the utterances for TJ. For SKK, some were found at the beginning (L tone) of the embedded wh-phrase. For the wh-embedded constructions in SKK, the F0 values of the L tone on the wh-phrases and those of the comp were extremely similar, with only a 2-3 Hz difference. Notice that the two F0s are quite similar in Figure 3.1.

In order to determine the most reliable reference point, the values were compared among the different contexts, sentence types, and speakers. Since no significant speaker variation was found, the data were pooled across speakers; the means and standard deviations (in parentheses) are given in Table 3.1.

Table 3.1. Maximum F0 (Max F0), minimum F0 (Min F0) and F0 range in TJ and SKK

TJ	Min F0	Target	Min/Target
F_DP_emb	118.8 (39.3)	283.1 (82.0)	0.42 (0.06)
F_wh_emb	117.9 (37.4)	283.8 (90.5)	0.42 (0.06)
F_DP_scrmb	117.4 (39.9)	280.8 (84.1)	0.42 (0.05)
F_wh_scrmb	115.8 (39.1)	277.7 (84.6)	0.42 (0.06)
mean	117.5 (38.7)	281.2 (84.8)	0.42 (0.06)
N_DP_emb	126.5 (42.1)	171.4 (61.4)	0.75 (0.06)
N_wh_emb	129.4 (42.9)	176.4 (65.7)	0.75 (0.07)
N_DP_scrmb	124.1 (40.3)	166.4 (57.0)	0.75 (0.05)
N_wh_scrmb	134.3 (47.2)	171.7 (62.6)	0.79 (0.07)
mean	120.7 (41.3)	218.1 (48.6)	0.55 (0.11)
G_DP_emb	124.4 (40.9)	145.0 (45.3)	0.86 (0.06)
G_wh_emb	126.8 (41.5)	149.2 (48.1)	0.85 (0.05)
G_DP_scrmb	123.0 (40.6)	144.8 (46.0)	0.85 (0.05)
G_wh_scrmb	132.1 (46.7)	151.4 (49.1)	0.87 (0.05)
mean	118.1 (39.1)	160.0 (48.0)	0.74 (0.10)

SKK	Min F0	Target F0	Min/Target
F_DP_emb	123.6 (42.2)	222.4 (74.3)	1.77 (0.23)
F_wh_emb	124.9 (43.9)	228.8 (84.8)	1.79 (0.26)
F_DP_scrmb	122.2 (42.1)	219.9 (74.3)	1.77 (0.26)
F_wh_scrmb	127.2 (45.1)	230.2 (84.1)	1.77 (0.25)
mean	124.5 (43.1)	225.3 (98.9)	1.77 (0.25)
N_DP_emb	126.5 (42.1)	171.4 (61.4)	1.35 (0.10)
N_wh_emb	129.4 (42.9)	176.4 (65.7)	1.35 (0.13)
N_DP_scrmb	124.1 (40.3)	166.4 (57.0)	1.34 (0.10)
N_wh_scrmb	134.3 (47.2)	171.7 (62.6)	1.28 (0.13)
mean	128.6 (43.1)	171.5 (61.4)	1.33 (0.12)
G_DP_emb	124.4 (40.9)	145.0 (45.3)	1.17 (0.08)
G_wh_emb	126.8 (41.5)	149.2 (48.1)	1.18 (0.07)
G_DP_scrmb	123.0 (40.6)	144.8 (46.0)	1.18 (0.07)
G_wh_scrmb	132.1 (46.7)	151.4 (49.1)	1.16 (0.07)
mean	126.6 (42.3)	127.6 (46.9)	1.17 (0.07)

As shown in Table 3.1, minimum F0 values remain fairly constant across the different conditions and languages, indicating that this is the best reference point, as influences of the conditions are directly reflected by the F0 values of the target with reference to minimum F0, regardless of the change in F0 range.

In order to confirm statistical significance, one-way ANOVAs using a generalized linear model were performed.⁷ The dependent variable considered was minimum F0 and the independent factors were context, object type (DP or wh), object position (embedded or scrambled) and interaction of the object type and position. There were no significant differences between F0 minima depending on context ($F(2, 642)=0.7702$, $p=0.6804$ for SKK, $F(2, 642)=0.8140$, $p=0.6656$ for TJ), object type ($F(1, 642)=2.0140$, $p=0.1559$ for SKK, $F(1, 642)=0.0011$, $p=0.9730$ for TJ), object position ($F(1, 642)=0.2154$, $p=0.6425$ for SKK, $F(1, 642)=0.0422$, $p=0.8372$ for TJ), or the interaction of object type and position ($F(1, 642)=0.8095$, $p=0.3683$ for SKK, $F(1, 642)=0.0734$, $p=0.7864$ for TJ). Thus, the ratio of minimum F0 over F0 peak of the target phrase was calculated for each token. The results of the experiment are presented in the following section.

3.3 Experimental results

Before turning to target F0 values with reference to the minimum F0, we need to confirm that there is in fact wh-intonation in the wh-LD-scrambled constructions. While this fact is quite obvious in SKK since wh-intonation is realized as a high plateau, a careful comparison is required in TJ to examine whether there is F0 compression in wh-LD-scrambled constructions compared to the DP-scrambled counterpart. Thus, I first explore the presence of the prosodic scope marking in the constructions involving LD-scrambling in TJ (§3.3.1), FJ (§3.3.2) and SKK (§3.3.3). As FJ exhibits the anomalies addressed in §2.3.2, only TJ and SKK are further analyzed in §3.3.4.

⁷ Statistical analyses were carried out using JMP version 7.0.

3.3.1 Wh-intonation in LD-scrambling constructions in Tokyo Japanese

As wh-intonation is implemented as F0 compression in TJ, the presence of wh-intonation can be determined by comparing a peak F0 at a certain point between the scrambled phrase and the Comp to the minimum F0. The peak F0 of the scrambled wh-phrase itself is not adequate for comparison, since the F0 peak of wh-phrases shows an F0 peak boost. Also, the topic (the subject of the matrix clause) and the embedded verb phrase yield somewhat reduced F0 values even in DP cases. Therefore, the F0 peaks of the embedded subjects were compared. As motivated before, a reference point—the F0 minimum—is necessary for more accurate comparison. The peak F0 values of the embedded subjects with reference to the minimum F0 values and the schematic pitch contours are given in Table 3.2 and Figure 3.2, respectively.

Table 3.2. F0 peak of the embedded subject (Sub_e) and the minimum F0 (Min F0) in TJ (Hz)

TJ	Sub _e	Min F0	Sub _e /Min F0
Wh	192.49	117.98	1.63
DP	204.63	117.63	1.74

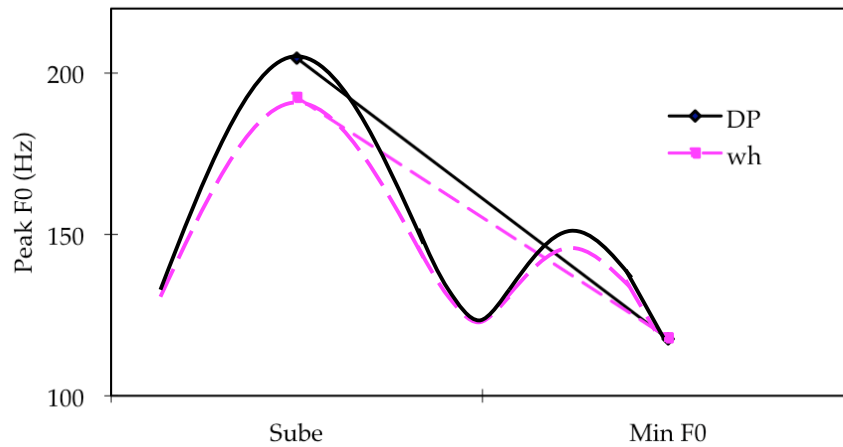


Figure 3.2. Schematic pitch contours of sentences with LD-scrambling in TJ

As shown in Table 3.2 and Figure 3.2 above, across speakers and contexts, the F0 peaks of the embedded subjects after wh-phrases were compressed compared to those after DP-phrases, indicating that prosodic scope marking is indeed present in wh-LD-scrambled constructions in TJ.

3.3.2 Wh-intonation in LD-scrambling constructions in Fukuoka Japanese

Recall that loss or change of wh-intonation is observed among younger speakers of FJ as discussed in §2.3.2 in detail. The FJ speakers in the current experiment, all undergraduates at Kyushu University, exhibited anomalies with respect to the prosodic pattern. One female speaker (FJF3) did not have the high plateau: she consistently produced a wh-phrase with a H⁺+L accent resulting in pitch contours similar to the TJ pattern. Four other speakers uttered a wh-phrase as unaccented, yet no accent deletion followed, indicating the lack of wh-intonation. Only one male speaker (FJM3) showed the high flat contour for the wh-LD-scrambling sentences, from the second repetition onward, suggesting that the pattern is not necessarily the norm among all speakers. A pitch contour for the wh-LD-scrambling context uttered by the speaker is illustrated in Figure 3.3.

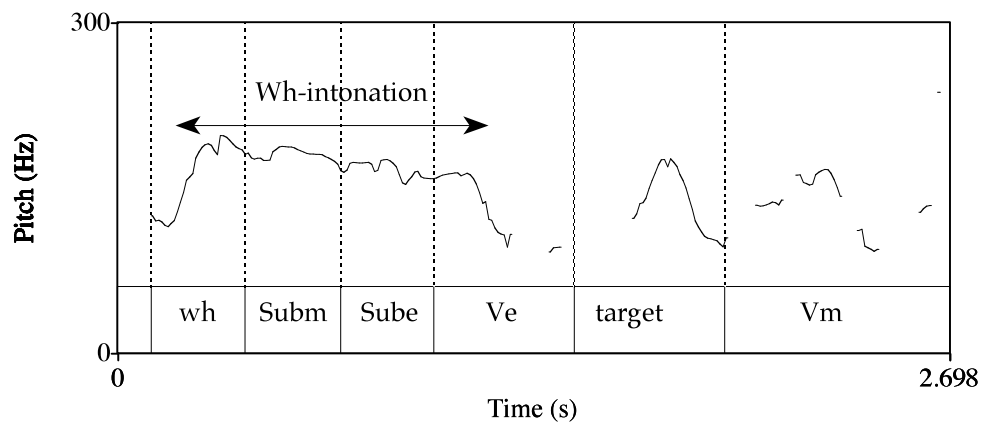


Figure 3.3. Pitch contour of a sentence with wh-LD-scrambling (uttered by FJ speaker M3)

As shown above, a high flat pitch contour with declination is observed from the scrambled wh-phrase in the sentence-initial position to the end of the embedded clause (V_e). While the lexical accent of the material between the wh-phrase and the embedded verb was deleted, that of the embedded verb itself was not, exhibiting a pitch fall on the accented mora. Recall that Kubo (1996) describes the intonation pattern of indirect wh-questions as bearing a penultimate accent when the Comp is *-ka*. The results of the present study indicate that a large number of speakers, including those from older generations, should be tested, as even this speaker's high plateau is not exactly comparable to what has been reported. Thus, only TJ and SKK data are further analyzed and discussed hereafter.

3.3.3 Wh-intonation in LD-scrambling constructions in South Kyeongsang Korean

F0 contours of the construction involving wh and DP scrambling in SKK are shown in Figure 3.4 below. Both utterances in Figure 3.4 were produced in the FOCUS context. However, regardless of the varying context, wh-scrambled constructions consistently exhibited wh-intonation, while ordinary implementation of pitch accents was observed in constructions where non-wh-DPs were scrambled.

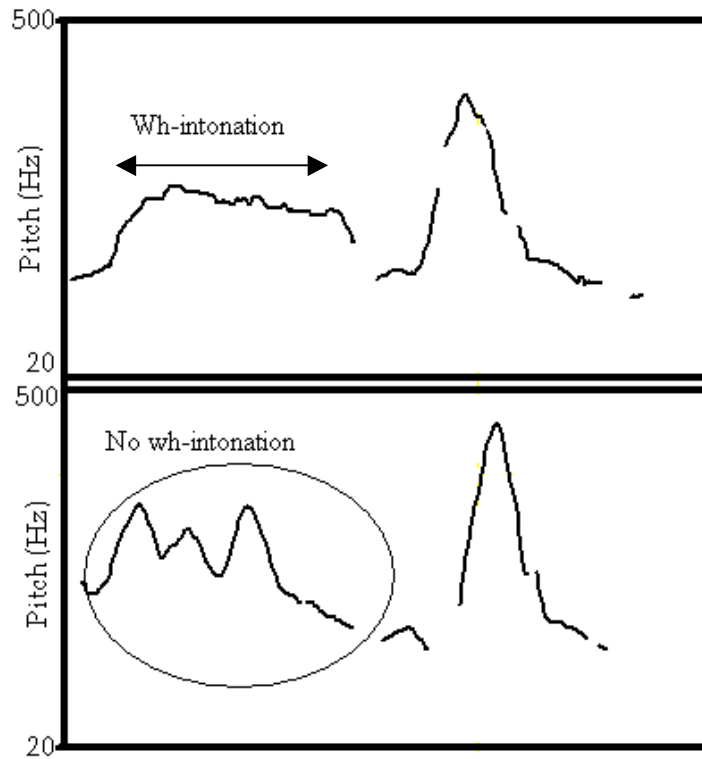


Figure 3.4. Pitch contours of a wh-scrambled (top) and a DP-scrambled (bottom) sentence in SKK (uttered by Speaker F1)

Observe that wh-intonation is present from the scrambled wh-phrase to the end of the embedded clause. Thus, by measuring the F0s of the scrambled wh-phrase and the embedded verb, it can be shown that the high plateau is assigned from the wh-phrase to the Comp where it takes scope for SKK. Recall the configurations of the LD-scrambling constructions, which are repeated in (3.10).

- (3.10) c) [DP Sub_m [Sub_e t_{DP} V_e-Comp] I.O. V_m-Q]
 d) [**wh** Sub_m [Sub_e t_{wh} V_e-Comp] I.O. V_m-Q]

For SKK, I calculated the ratio of the F0 of the embedded verb phrase to that of

the scrambled phrase (DP or wh). While the values are predicted to be less than 1 due to downstep and declination for the DP-scrambled types, those for the wh-scrambled sentences should be close to 1. Since all speakers exhibited the same pattern, the peak F0 values of the scrambled phrases and the embedded verbs were pooled; the means are given in Table 3.3.

Table 3.3. F0 peak of the Scrambled Phrase (SP) and the embedded verb (V_e) in SKK (Hz)

SKK	SP	V _e	V _e /SP
Wh	213.95	212.28	1.00
DP	237.71	182.68	0.79

As presented in Table 3.3, no signs of declination or downstep were found between the F0 peaks of the scrambled wh-phrases and those of the embedded verbs, while the F0 peaks of the embedded verbs in DP-scrambled constructions exhibited the expected declination by an average of 55.03 Hz compared to those of the sentence-initial DPs. The pitch patterns of the LD-scrambled sentences are schematically shown in Figure 3.5 below.

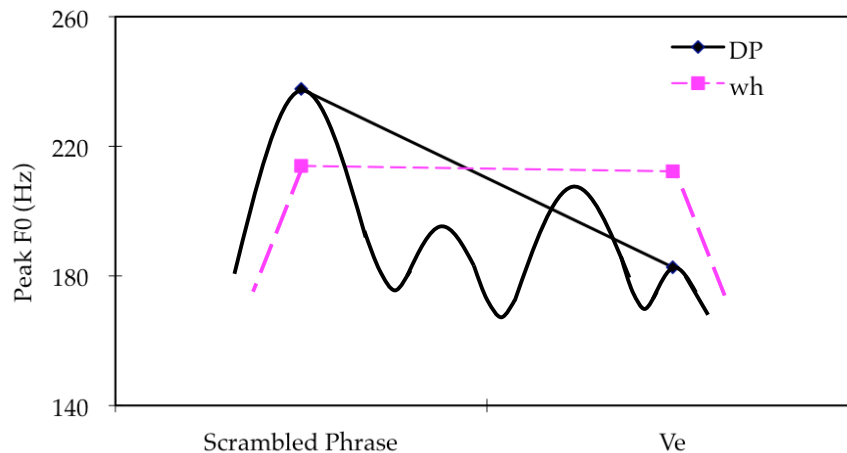


Figure 3.5. Schematic pitch contours of sentences with LD-scrambling in SKK

The pitch contours in Figure 3.5 clearly indicate that wh-intonation is present not only in wh-in-situ but also in wh-LD-scrambling constructions.

Let us now turn to the results for the behavior of the target phrase as conditioned by context.

3.3.4 Relative F0 of the target depending on information structure

The peak F0s of the target phrase with reference to the minimum F0s (*i.e.* the reference) were pooled across speakers as all the speakers within each language exhibited the same pattern. The mean ratios of the target F0 peak over the minimum F0 are shown in Figure 3.6, separated by language.

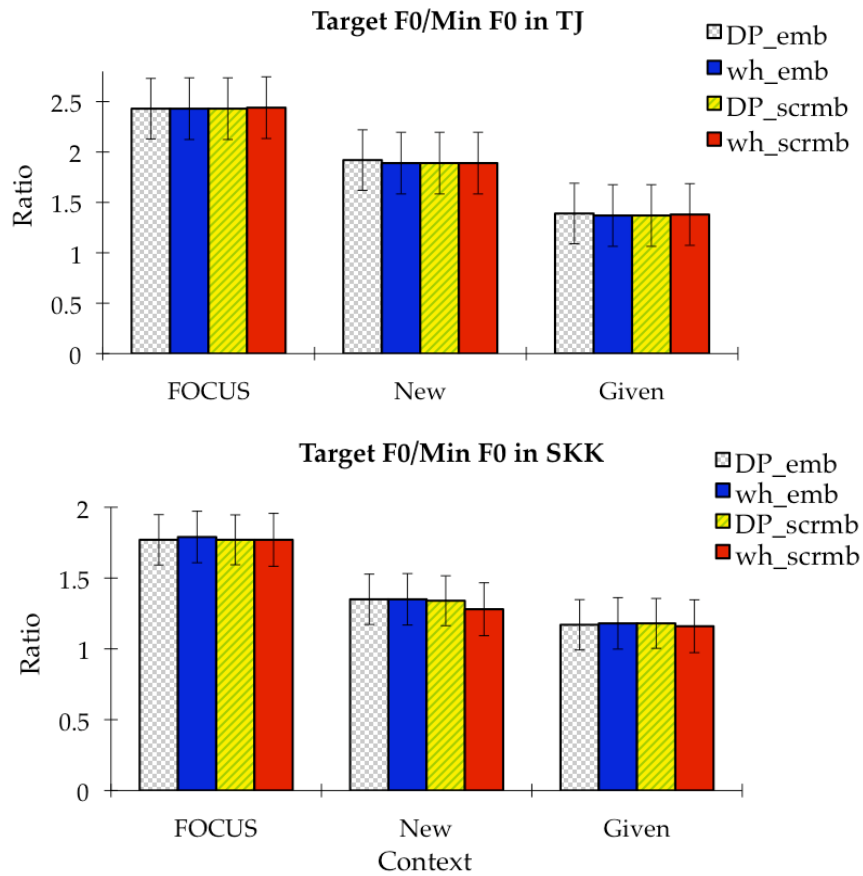


Figure 3.6. The target F0s with reference to the minimum F0 (Min F0) in TJ (top) and in SKK (bottom)

There are appreciable differences in the target F0s and the ratios among the contexts; yet, there are no appreciable differences among the four different sentence types in either language. Somewhat higher ratio values for the wh-scrambled cases in SKK can be attributed to the greater minimum F0 rather than a lower target F0. Recall that the pitch realization of the high plateau in SKK is quite high, and the duration of the Comp (*-ci*) is short when falling tone is assigned. This triggers an undershot effect for the L tone when followed by an H-initial word. For the Given context, the undershot effect is weak since the F0 excursion size of the following target phrase is small.

Overall, across the speakers and the languages, the New cases exhibit more variation in F0 peaks of the target resulting in an appreciable number of tokens overlapping with the values in the Given cases: 26.6% for SKK and 21.8% for TJ. It seems that speakers sometimes accommodate the discourse-new indirect object as given, probably because of the relatively minor importance of the phrase in terms of conveying information.

In order to test the statistical significance of the differences statistically, one-way ANOVAs using a generalized linear model were performed. The dependent variable considered was the ratio of minimum F0 over target F0. The independent factors were context, object type (DP or wh), object position (embedded or scrambled) and interaction of the object type and position.

In TJ, one-way ANOVAs show that there is a significant effect of context on the ratios of minimum F0 over target F0 ($F(2,642)=638.1283$, $p<0.0001$), yielding significant differences in the ratios among the three contexts (FOCUS > New > Given). It is confirmed that object type or position does not play a significant role for the ratios in TJ ($F(1,642)= 0.0244$, $p=0.9156$ for type; $F(1,642)= 0.0112$, $p=0.9156$ for position). Also, the interaction between

object type and position was not significant ($F(1,642)=0.2301$, $p=0.6314$).

In SKK, as expected from Figure 3.6, there is a significant effect of context on the ratio ($F(2,642)=540.0635$, $p<0.0001$). The *post-hoc* comparisons indicate that all three contexts are differentiated (FOCUS > New > Given). On the other hand, there was no significant difference in the ratios depending on object type ($F(1,642)=0.3424$, $p=0.5585$) or position ($F(1,642)=1.9619$, $p=0.1613$). The interactions of object type and position was not significant ($F(1,642)=0.4829$, $p=0.4671$).

3.4 Discussion

3.4.1 Resolving the puzzle

The experimental results of the current study show that the right edge of the wh-intonation (*i.e.* the high plateau) in SKK consistently aligns with the embedded Comp regardless of the position of the wh-phrase (in-situ or LD-scrambled). Also, there was no significant effect of the object type (DP or wh-phrase) or the object position (embedded or scrambled) on the F0 excursion size of the target phrase following the embedded Comp. Instead, an immediate effect of discourse context on the F0 of the post-wh-intonation material was found. The results for the wh-scrambled case are schematically summarized in Figure 3.7 below.

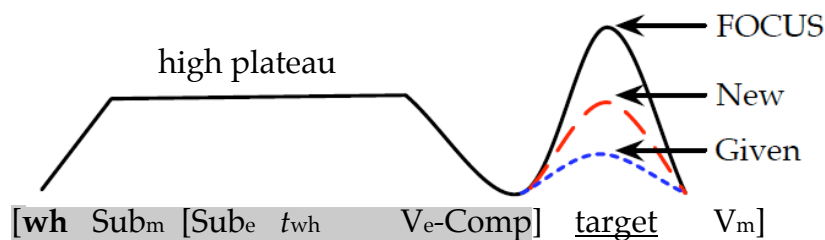


Figure 3.7. Schematic pitch contours for wh-LD-scrambled sentence type in SKK

TJ yielded similar results; neither the position (embedded or scrambled) nor the type of object (wh-phrase or DP) induces pitch compression or boost in the element immediately following the embedded clause. Schematic pitch contours for the wh-scrambled case are illustrated in Figure 3.8.

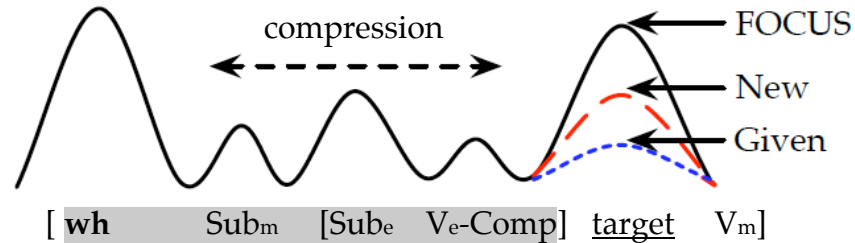


Figure 3.8. Schematic pitch contours for wh-LD-scrambled sentence type in TJ

Comparing the prosodic patterns of SKK and those in TJ in the varying contexts enables us to resolve the puzzle of wh-LD-scrambling constructions in TJ. The two claims concerning the issue are repeated below.

(3.11) The puzzle regarding the domain of wh-intonation in the LD-scrambling contexts

a. Ishihara (2002), Kitagawa and Deguchi (2002)

wh [CP Sub_m [CP t_{wh} V_e-Comp_[+wh]] V_m]

b. Ishihara (2004, 2005): mismatch

wh [CP Sub_m [CP t_{wh} V_e-Comp_[+wh]] V_m]

In the experiment reported in this study, the F0 of the material following the scrambled wh-phrase is consistently compressed up to the embedded Comp in TJ. Yet, the F0 of the material following the Comp is either prominent or reduced depending on its discourse structural properties. The results suggest

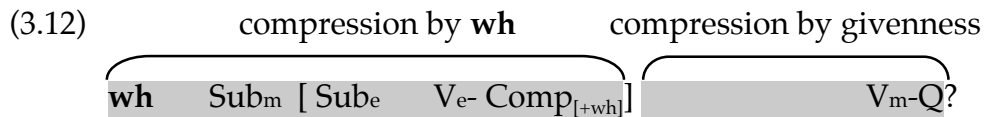
that, parallel with SKK, neither the position of the object (embedded or scrambled) nor the type of the object (wh-phrase or DP) triggers pitch compression or a raising of the post-Comp material. Further, the right edge of wh-intonation in the LD-scrambling context is aligned with the embedded Comp as in (3.11a).

These results contradict the assertion that the wh-intonation domain in wh-element-scrambled sentences is the matrix clause suggested by Ishihara's work (2004, 2005). Recall once again that discourse context was not controlled for in Ishihara's experiment, although, as I have repeatedly emphasized, it is crucial to do so in TJ, since both discourse-givenness and wh-intonation are realized by F0 compression in this dialect. The F0 of the material following the embedded Comp depends on discourse structural properties, such as New/Givenness or FOCUS. Thus, it is premature to conclude that the results of Ishihara's (2004, 2005) experiment show that the wh-intonation domain includes matrix material and extends to the end of the matrix clause in wh-LD scrambled sentences with scrambled wh-phrases that take embedded scope.

The remaining question to be considered here is how to account for the disparity between the experimental results reported in the current work and the prosodic pattern in (3.11b) reported in Ishihara (2004, 2005). Based on the experimental evidence from SKK and FJ as well as the relevant properties of discourse structure-determined prosody in TJ, I argue that the pitch compression on the material following the embedded clause in (3.11b) is induced by information status—specifically, discourse-givenness—as an effect independent from wh-intonation. It is important to keep in mind here that the lack of explicit prior discourse is not necessarily equivalent to a neutral context, especially in wh-question environments (Crain & Steedman 1985,

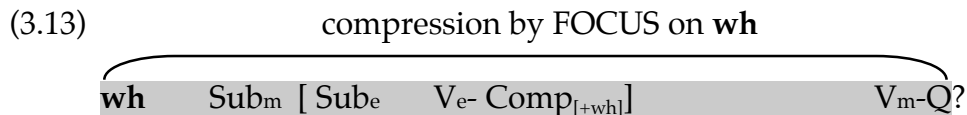
Altmann & Steedman 1988). Thus failure to control for discourse context may be at work in the production of the pattern in (3.11b).

There are two possible information structures in which the intonation pattern in (3.11b) is observed. First, as in the Given context of the experiment in this chapter, the post-Comp material could be considered discourse-given, and therefore prosodically reduced.



As F0 reduction continues through the matrix material, *wh*-intonation domain is obscured by the same phonetic realization of information status of the matrix material in TJ.

Another possibility is that FOCUS intonation is implemented on the entire clause by the scrambled *wh*-phrase as shown in (3.13).



It is certainly conceivable that the speakers assigned FOCUS intonation to the sentence because they deduced that the scrambling was triggered by the presence of FOCUS on the scrambled element. It should be noted that FOCUS is sometimes claimed to motivate LD-scrambling (Miyagawa 2001).

Note that in both cases, the F0 compression on the material following the embedded clause is triggered by discourse properties—discourse givenness or FOCUS—as an effect independent of *wh*-intonation. Therefore,

the domain of wh-intonation in wh-LD-scrambling contexts terminates with the embedded Comp as in (3.11a), but the intonation pattern in (3.11b) can be observed accompanying a different discourse structure.

Still, a question arises as to why the peak F0s of the target material in wh-scrambled contexts was more compressed than those in DP scrambled contexts in Ishihara's experiment. Ishihara (p.c.) mentions a potential alternative account: a scrambled wh-phrase bears an extra FOCUS feature. The difference should indeed be attributed to the distinct informational accommodation between a wh-phrase and a DP since there was no specific context provided. However, it is not obvious why only a scrambled wh-phrase, and not a scrambled DP, would be 'extra-FOCUSed'. It should be noted that non-questioned material is generally presupposed in wh-interrogatives (Postal 1971 and Erteschik-Shir 1986, among others). Thus, it is conceivable that the material outside the semantic scope of a wh-phrase is normally accommodated as Given when there is a lack of an explicit context.

3.4.2 The effect of discourse structure on prosody

The results of the experiment in this chapter clearly demonstrate that the fundamental frequency of the target phrase is not influenced by the four different sentence types, but by the context, exhibiting how information-structural properties are prosodically implemented. The prosodic correlate of information status is F0 excursion size in these languages. Specifically, as widely assumed, discourse-given material is not prominent relative to its neighbors, demonstrating pitch compression (Ladd 1980 for English, Sugahara 2003 and Selkirk 2006 for Japanese). One question arises here: is the pitch compression occurring on post-wh material in TJ induced by its givenness?

The answer lies in the F0 difference of embedded subjects between DP- and wh-scrambled constructions in TJ. Recall that, in wh-LD-scrambling constructions, those materials in the FOCUS range are given. Note that the F0 of the material was further compressed after a wh-phrase compared to that after a DP. Thus, I conclude that compression by givenness is independent from prosodic wh-scope marking. This finding is in accord with Sugahara's (2003) finding that givenness further compresses the F0 of post-FOCUS material which has already been compressed. Also, it is not surprising that FOCUS is implemented by expanding the pitch range (Pierrehumbert and Beckman 1988, Kubozono 1989, Nagahara 1994, Sugahara 2003, among others).

The most interesting finding is that the three discourse properties—FOCUS, Newness, and Givenness—are prosodically distinguished, yielding distinct F0 excursion sizes. Recall that assumptions and notions of information structure are diverse in the literature, as discussed in Chapter 1. This supports, at least prosodically, a three-way distinction of the information status: FOCUS (F-marking) *vs.* Given (G-marking) *vs.* New (unmarked) (Féry and Samek-Lodovici 2006, Selkirk 2006), rather than two-way: Focus *vs.* Given (Schwarzschild 1999). However, it does not exclude the possibility of a four-way distinction: \pm FOCUS and \pm Given (Féry and Ishihara 2009). Note that the combination [+FOCUS, +Given] is not present in the three-way system. As pointed out by Ishihara (p.c.), in order to determine which is more appropriate, it would be necessary to examine the phonetic manifestation of the combination such as Second Occurrence Focus.

However, F0 distinction in production does not necessarily indicate that speakers can *discriminate* the three contexts. The F0 difference between the

FOCUS and New, and between New and Given contexts, were 63.1 Hz and 58.1 Hz, respectively, for TJ and 53.8 Hz and 43.9 Hz, respectively, for SKK. Still, these large differences are not necessarily perceived by speakers. Subtle differences such as those of 10 Hz as in Ishihara's experiment are even less likely to be discriminated. It is an interesting question how large a difference in Hz is required to be noticed perceptually. It may be that people tend to be insensitive to F0 differences within a sentence with greater complexity. For instance, the tested structure in the current study is quite complicated due to LD-scrambling that increases the processing load. Also, there seems to be the effect of the position of the target phrase and the F0 of the neighboring material. Further, the target phrase is located in the second from the final position. Under the circumstances, it may be difficult to discriminate the differences among the target F0s in the different contexts unless the F0 peak is much greater than neighboring material as in the FOCUS context. The critical F0 differences required to be perceived in various contexts has yet to be fully elucidated. Further research is necessary considering the parameters such as the complexity of a sentence, the position of the target phrase in a sentence, and the F0 range of the neighboring material.

3.5 Conclusion

In this chapter, I have examined the prosodic marking of wh-scope in order to resolve the puzzle regarding the domain of wh-intonation in LD-scrambling constructions in TJ, FJ and SKK by taking information structure into account. A phonetic experiment was conducted in which different contexts were provided.

The results show that when a wh-phrase is scrambled out of the

embedded clause, the right edge of wh-intonation is not aligned with the matrix Comp but with the embedded Comp regardless of the type (DP or wh) or position (embedded or LD-scrambled) of the embedded object. This finding corroborates the generalizations addressed in §2.6 in that the right edge of the wh-intonation domain consistently aligns with the Comp_[+wh], showing that the earlier proposal claimed by Ishihara (2004, 2005) cannot capture the full set of data.

The data also show that discourse properties, independently from wh-intonation, play a crucial role in predicting the F0 excursion size of the material immediately following the embedded Comp. Thus, the relative prominence among the three contexts is expected to be compatible across sentence types and languages.

These findings not only resolve the empirical issue at hand, but also show that in endeavoring to understand the nature of the syntax-phonology interface, it is crucial to distinguish wh-intonation from prosody conditioned by information status (FOCUS *vs.* New *vs.* Given). It is also implied that the information regarding 'wh', rather than FOCUS, should be available for the formation of prosodic scope marking for wh-phrases.

CHAPTER 4

THE ROLE OF WH-INTONATION ON THE DISAMBIGUATION OF WH- SCOPE¹

4.1 Introduction

In this chapter, I investigate the prosodic marking of wh-scope with special attention to the structure where a wh-phrase is located in an embedded clause while it takes matrix scope. Specifically, I focus on how prosodic cues and pragmatic context influence the processing of wh-scope in potentially ambiguous wh-interrogatives, the basic configuration of which is given in (4.1).

(4.1) [Sub_m [Sub_e **wh** V_{e-whether}] V_{m-Q}]

The embedded Comp *whether* is known to exhibit island effects in many languages. An English example is shown in (4.2).

- (4.2) a. 'Did John ask what Mary ate *t_{what}*?'
b. ?*'What did John ask [whether Mary ate *t_{what}*]?'

As shown in the English example in (4.2b), the wh-phrase in the embedded clause is banned from taking matrix scope out of the wh-island.² In contrast, it

¹ An earlier version of this study was presented at the 45th Annual Meeting of Chicago Linguistics Society held in April 2009, appearing on the Proceedings of CLS 45.

² Weak islands are characterized as allowing the extraction of arguments but not adjuncts. The distinction was first pointed out by Rizzi (1990). See also Cinque (1990) for the diagnostics distinguishing strong *vs.* weak islands.

has been widely recognized that there is no wh-island effect for in-situ wh-phrases (Baker 1970, Chomsky 1973) as discussed in Chapter 1. Huang (1982) reports the same absence of wh-island effects for wh-in-situ in Chinese. However, numerous researchers have claimed that this pattern is degraded in Japanese and Korean. A Japanese question corresponding to (4.2) is given below. The judgment is from its original source (Nishigauchi 1999).

- (4.3) John-wa [Mary-ga **nani-o** tabeta-ka] kiita-Ø?
 John-Top Mary-Nom what-Acc ate-Comp asked-Q?
 a. 'Did John ask what Mary ate *t_{what}*?'
 b. *'What did John ask [whether Mary ate *t_{what}*]?'

It has been impressionistically judged that the matrix scope reading is not available for a question as in (4.3) (Nishigauchi 1990; 1999, Watanabe 1992, Yoshida 1998). Given the unacceptability of the matrix scope reading, it has been widely held that wh-phrases obey the wh-island effect in Japanese. Similar judgments have been reported for Korean (H.S. Han 1992, H.S. Choe 1995). However, dissenting judgments which accept the matrix reading in (4.3b) have also been reported both for Japanese (Takahashi 1993, Deguchi and Kitagawa 2002, Ishihara 2003, Hirotsu 2005), and for Korean (H.S. Lee 1982, C.M. Suh 1987, H.K. Hwang 2006, H.J. Hwang 2007).

Recall that 'acceptability' in the current study is understood to be a complex notion determined by multiple factors, rather than solely by formal/structural properties of written examples, as discussed in §1.1. It is worth reiterating that most of the previous literature develops syntactic accounts relying on impressionistically perceived acceptability judgments typically based on written examples, without considering pragmatic

plausibility or prosody. In the present study, I investigate experimentally how these factors interact through a series of production and comprehension tests. Based on results supporting Kitagawa (2005a), I argue that the perceived degradedness of the matrix scope interpretation of questions as in (4.3) is due to two factors; the relative difficulty of finding plausible discourse contexts for such questions and the difficulty of assigning the prosodic pattern required for the matrix scope reading. Before turning to the experiments, I first review previous studies on this issue where contextual or prosodic effects have been taken into account.

Despite the dominant tendency to consider only syntactic factors rather than prosody or discourse factors in discussing *wh*-islands, Nishigauchi (1990) mentions the influence of prosody in an impressionistic way in TJ. Although he excludes the possibility of the matrix scope interpretation as in (4.3b), he notes that the embedded *wh*-phrase can take matrix scope if another *wh*-phrase follows it in the same clause as in (4.4).

(4.4) [Sub_m [**wh**₁ **wh**₂ *V_e-whether*] V_m-Q]

A Japanese example and the two possible interpretations in Nishigauchi (1990) are presented below.

- (4.5) Tanaka-kun-wa [**dare**-ga **nani**-o tabeta-ka] oboete-imasu-ka
 Tanaka-Top who-Nom what-Acc ate-Comp remember-Prog-Q
- a. Does Tanaka know who ate what?
 - b. For which *x*, *x* a person, does Tanaka know [what *x* ate]

Nishigauchi (1990) claims that the matrix reading (4.5b) is acceptable if a

‘marked intonation’ pattern with a ‘heavy stress’ is assigned to the wh-phrase that takes matrix scope. Also, the word order is crucial; only the first wh-phrase is capable of taking matrix scope. Thus, if the two wh-phrases are switched, only *nani* ‘what’, not *dare* ‘who’ can take matrix scope. Based on the assumption that focused material generally receives heavy stress and undergoes fronting, he concludes that “a wh-expression which receives extra focus is capable of taking wide scope, in violation of the wh-island effect” (p. 35).

For Seoul Korean, the standard variety, H.S. Lee (1982) notices the role of prosody in this construction. He observes that when the matrix verb is *mwutta* ‘ask’, wh-phrases in an embedded clause can take matrix scope depending on the intonation, even though this interpretation is less natural, as presented in (4.6).³

- (4.6) John-i ney-key Bill-i **mwues**-ul hayssnun-ci
 John-Nom you-Dat Bill-Nom what-Acc did-Comp
 mwule-poass-nunya?
 ask-tried-Q
 a. ‘Did John ask you what Bill did?’
 b. ? ‘For which x [John asked you [if [Bill did x]]]

³ H.S. Lee (1982) also observes an asymmetry between matrix verbs such as ‘ask’ and those like ‘know’ or ‘remember’: the latter verbs do not allow the matrix reading. Given this asymmetry, he concludes that the embedded Comp *-ci* forms a wh-island only with verbs such as ‘remember’ or ‘know’. It seems that the semantics of matrix verbs—specifically *factivity*—plays a role here (Whitman, p.c.). Note that distinct behaviors have been noticed among complements of verbs like ‘know’, ‘remember’, ‘realize’ and ‘regret’, namely, factive predicates and those of verbs like ‘wonder’ and ‘ask’. This asymmetry has been accounted for by assuming that complements of the two types of predicates are syntactically different (Berman 1991) or that they have different semantic types (Suñer 1993). See also Lahiri (2002) who argues that there are two predicate classes with distinct semantic types.

Let us now turn to some accounts of prosodic scope marking. Ishihara (2002, 2003) and Kitagawa and Deguchi (2002) explicitly argue that the domain of *wh*-scope correlates with the domain of *wh*-intonation. In accepting a *whether*-island violation permitting a matrix scope interpretation, they argue that the right edge of F0 compression is coordinated with the matrix Comp on that reading, whereas F0 compression terminates with the embedded Comp on the embedded scope interpretation.

In fact, the embedded scope interpretation takes precedence over the matrix scope interpretation. Recently, Kitagawa (2005a) convincingly argues that the matrix-scope interpretation is permitted but disfavored, due to the unusual presuppositions and the monotonous prosodic pattern required for the matrix scope reading. These are the two factors tested in the present study. An example from Kitagawa (2005a) is given in (4.7).

- (4.7) Satoukun-wa [Suzukikun-ga **nani-o** tabeta-ka] oboeteiru-no?
 Satoukun-Top[Suzukikun-Nom what-Acc ate-Comp] be.remebering-Q
 ‘What_i is Satoukun remembering whether Suzukikun ate it_i?’

Kitagawa (2005a) points out that two presuppositions are required in order to interpret the *wh*-phrase as taking matrix scope.

- (4.8) a. There is some food item to which some special attention is being paid
 in such a way that whether or not Mr. Suzuki ate it is at issue.
 b. Mr. Sato remembers whether or not Mr. Suzuki ate some specific
 food item.

Kitagawa further claims that satisfaction of the presuppositions above

requires speakers to imagine a somewhat unusual pragmatic context like (4.9).

- (4.9) Mr. Suzuki is suffering from food poisoning and the identity of some specific food item as its cause is being sought. Mr. Sato is believed to remember whether or not Mr. Suzuki ate some specific food item, which may be the crucial piece of information. In quest of the identity of this food item, the question was asked of the person who is believed to know the answer.

Also, the intonation pattern for the matrix reading where F0 compression continues to the end of the question is not a ‘default prosodic pattern’ as it violates a general phonological principle ‘avoid monotony’ suggested by Selkirk (1984) and Kubozono (1993). The default prosodic pattern for the structure (4.1) is the one for the embedded scope reading, and it induces the bias toward that interpretation. This discussion suggests that the bias toward the embedded scope interpretation can be ameliorated by providing plausible contexts and prosody.

This approach was instrumentally tested in Hirotani (2005). As discussed in §2.2, however, wh-island effects or a possible preference for the embedded scope reading were not considered in her work. In arguing for the optional nature of the prosodic scope marking, Hirotani (2005) presents the results of a comprehension test where matrix scope questions with appropriate prosody elicited a matrix scope interpretation only 46% of the time. Recall that four different prosodic patterns were produced by Hirotani herself as noted in §2.2. The four conditions are repeated below.

(4.10) Four prosodic conditions tested in Hirotani (2005)

- a. boundary, no F0 compression of V_e , V_m
- b. boundary, F0 compression of V_e (no compression of V_m)
- c. no boundary, no F0 compression V_e (compression of V_m)
- d. no boundary, F0 compression of V_e , V_m

The intended scopes and contexts in which the stimuli were uttered were not provided. Nevertheless, Hirotani claims that two native speakers of TJ other than herself accepted those utterances as natural. While it is not clear whether she tested the naturalness of her tokens in a specific *wh*-scope context or not, Hirotani's results do seem to show that the F0 excursion size of the verbs does not play a critical role in naturalness judgment. This is not surprising, given that not only the *wh*-scope but also other types of information such as givenness and newness are implemented through the manipulation of F0 height. As different F0 excursion sizes are observed in different contexts, speakers can judge various F0 realizations as natural. Also, recall that the bias towards the embedded scope reading is not considered in Hirotani's study. While she claims that the stimuli are scope-neutral, some stimuli in the comprehension test seem to favor the embedded reading. A sample stimulus is presented in (4.11).

(4.11) Otetsudaisan-wa [shujin-ga **dare-o** sagashiteiru-ka]
maid-Top [master-Nom who-Acc looking.for-Comp
iimashita-ka?
said-Q

- a. 'Did the maid tell you who the master was looking for?'
- b. 'Who₁ did the maid tell you if the master was looking for her₁?

Given only the sentence above, it is difficult to come up with a situation for the matrix reading. The following is an example of such a situation: 'The maid is believed to have said whether or not the master was looking for a specific person, the identity of whom is a crucial piece of information.'

Hirotsu (2005) also argues that the presence or absence of a MaP boundary is not obligatory based on a production test where unambiguous wh-interrogatives were recorded. One example set of both scope questions is given below. Scope-specific Comps at the final position of each question are marked by underlining.

(4.12) Test sentences of the production test in Hirotsu (2005)

a. embedded scope

Yamazaki-wa Ninomiya-ga **dare-o** maneita-ka
 Yamazaki-Top Ninomiya-Nom who-Acc invited-Comp
 morasita-nokai?
 revealed-Comp[-wh]

'Did Yamazaki reveal who Ninomiya invited?'

b. matrix scope

Yamazaki-wa Ninomiya-ga **dare-o** maneita-ka
 Yamazaki-Top Ninomiya-Nom who-Acc invited-Comp
 morasita-ndai?
 revealed-Comp[+wh]

'Who did Yamazaki reveal whether Nonimiya invited?'

Notice that different matrix Comps with respect to [wh] were used in order to disambiguate the wh-scope. In assuming that the [+wh] Comp in (4.12b) makes the sentence fully acceptable as a matrix question, Hirotsu (2005) judged whether there is a MaP boundary immediately after the embedded Comp based on auditory impressions, the degree of initial lowering, and the

comparison of F0 maxima between the embedded verb and the matrix verb. She then concluded that a MaP boundary was present when the F0 maxima of the matrix verb were higher than those of the embedded verb, and the degree of initial lowering was large enough. The percentages of MaP boundary insertion, separated by speaker, are given in Table 4.1.

Table 4.1. Percentage of MaP boundary insertion after embedded Comp (Hirotani 2005, p. 61)

	embedded	matrix
Speaker JO	100	100
Speaker IK	100	50
Speaker TA	0	0
Speaker HK	75	50

While there is a tendency to insert a MaP boundary after the embedded Comp more frequently for the embedded scope questions than for the matrix scope questions, no obligatory boundary insertion or deletion is observed. Based on these results, Hirotani (2005) claims that there is evidence for the optionality of wh-intonation.

However, it is not clear from Hirotani's data that the participants in her study completely accepted the matrix questions. As uncommon presuppositions are still required for the matrix reading, it seems probable that the bias towards embedded scope was not completely eliminated solely by the scope specific endings. It should be noted that Yoshida (1998) judges the sentence in (4.12b) as ungrammatical. Thus, it is conceivable that (4.12b) is not acceptable for the speakers who have strong wh-island effects even if the matrix-scope-specific Comp *-ndai* forces the matrix reading.

Further, Kori (1989) shows that the prominence of the final constituent

of an utterance is more reduced than that of the other constituents based on her production data. Her finding indicates that the F0 reduction of the matrix verb for the embedded scope questions observed in Speaker TA's or Speaker HK's utterances, which is interpreted as indicating lack of a MaP boundary by Hirotani (2003), does not necessarily support the notion of optionality of wh-intonation for marking the wh-scope.

Another experimental study on the role of prosody in the construction under investigation is Hirose and Kitagawa (2007) for TJ. Hirose and Kitagawa (2007) report the results of a production test in which speakers accept both scope readings when a context is given to trigger a unique scope reading. Also, the utterances recorded reflect prosodic scope marking, as F0 peaks of matrix verbs in embedded questions are greater than those in matrix questions. However, in a comprehension test, the embedded scope reading was preferred regardless of the prosodic pattern, indicating that the prosodic cue in TJ was not a sufficient cue for listeners to override the bias in favor of the embedded scope reading in the resolution of the scope ambiguity.

Comprehension tests in TJ conducted by Hirotani (2005) and Hirose and Kitagawa (2007) yield similar results; the compressed F0s of matrix verbs are not consistently interpreted as a prosodic marker of the matrix wh-scope. I suspect that the asymmetry between the production and the comprehension results in TJ is due to the fact that F0 compression does not exclusively indicate wh-scope since the phonetic encoding for givenness is also F0 compression. Recall that in FJ and SKK, on the other hand, the two are prosodically distinct, suggesting the possibility that prosody plays a more crucial role in scope disambiguation due to the wh-specific prosodic pattern in these languages. This possibility will be experimentally tested in the present

chapter. Further, note that previous studies on prosodic effects on scope disambiguation have reported only the average values without discussing speaker differences. None of them addressed variability in acceptability judgments. Given the lack of agreement in acceptability judgments in the literature and the observed differences among speakers, careful discussion of speaker differences is necessary.

Interestingly, Hirotsu (2005) measured ‘listening time’ (the time taken for listening to the sentences) and ‘response time’ (the time taken for choosing the appropriate answer) separately for wh-scope assignment in the four prosodic conditions in (4.10). In assuming that ‘listening time’ reflects the processing cost for the sentence whereas ‘response time’ represents the degree of assuredness about the interpretation listeners obtained, she asked participants to press the space bar when they understood each stimulus. ‘Listening time’ is measured from the offset of each stimulus to the moment that the space bar was pressed. The results are summarized in Table 4.2.

Table 4.2a. Listening Time (LT) and Response Time (RT) of embedded responses (Hirotsu 2005, p. 144)

	# of cases	LT (ms)	RT (ms)
A: Boundary, No Pitch Compression	40	1424	1748
B: Boundary, Pitch Compression	40	1134	1635
C: No Boundary, No Pitch Compression	39	1264	1916
D: No Boundary, Pitch Compression	37	1019	1870

Table 4.2b. Listening Time (LT) and Response Time (RT) of matrix responses (Hirotsu 2005, p. 146)

	# of cases	LT (ms)	RT (ms)
A: Boundary, No Pitch Compression	13	1106	2189
B: Boundary, Pitch Compression	16	1193	1812
C: No Boundary, No Pitch Compression	33	1308	1994
D: No Boundary, Pitch Compression	34	1062	1879

With respect to the boundary effect, the boundary conditions (A, B) took longer to process than the no-boundary conditions (C, D) when embedded scope was assigned to the *wh*-phrases. As Hirotani (2005) also mentions, this result is counter-intuitive in that the boundary marks embedded scope that is the preferred interpretation over matrix scope readings. As pointed out in §2.2, the prosodic conditions B and D are canonical prosodic contours of embedded and matrix scope questions, respectively. I suspect that typical prosodic patterns were more quickly comprehended compared to unexpected pitch contours. In simply comparing the listening times of the distinct scope responses, Hirotani (2005) concluded that the matrix interpretation is not more difficult to process than the embedded scope interpretation, which is in contrast to the findings of behavioral studies (Gibson 1998; 2000, Hawkins 1999, Miyamoto and Takahashi 2002, Aoshima et al. 2003, Arnon et al. 2005 among others). This issue is taken up in §4.3.3.1.

Of particular interest in the current study are two factors—prosody and contextual plausibility. The relative role of these two factors can be assessed by presenting speakers with a potentially ambiguous context and observing how the two factors affect the choice of interpretation. In this chapter, I focus on these two factors in my experiments on the resolution of *wh*-scope ambiguity. The specific question to be examined here is whether prosody or discourse factors can guide the processing of *wh*-scope and override the *wh*-island effect. Although the embedded scope interpretation is favored when no prior discourse context is given, I hypothesize that *wh*-intonation and the presentation of plausible contexts for a matrix reading facilitate the otherwise disfavored matrix scope interpretation. The results suggest that a strong role is played by prosody and contextual plausibility in the disambiguation of *wh*-

scope in the construction at issue indicating that those factors need to be integrated into a comprehensive theoretical linguistic treatment.

This chapter is structured as follows. §4.2 presents the methodology and the results of the production experiment designed to test how contextual plausibility influences wh-scope disambiguation and prosody. §4.3 turns to a comprehension test in order to investigate how prosody influences wh-scope interpretation. §4.4 addresses relevant issues and theoretical implications of the experimental results. §4.5 concludes this chapter.

4.2 Production test

In this section, pitch contours of potentially scope-ambiguous wh-interrogatives are explored. Specifically, the questions are embedded in a dialogue in order to provide a disambiguating context. The goal of the production test is to investigate the role of a discourse context which favors a matrix scope interpretation and to see whether it forces the marked reading, as well as whether the distinct scope interpretations are reflected in the pitch contours.

4.2.1 Materials

Four interrogatives using two different endings were elicited for each language—TJ, FJ, and SKK. All of the test interrogatives, whose structure is shown below, were bi-clausal with wh-in-situ and scopally ambiguous.

(4.13) [Sub_m [**wh** V_{e-whether}] V_{m-Q}]

Only wh-phrases in argument positions, *i.e.* *who* and *what*, were used. Two

matrix verbs were tested: ‘asked’ (*tazúneta* for Japanese, *múlessta* for SKK) and ‘to be investigating’ (*sirábeteru* for Japanese, *cosahakoíssta* for SKK).⁴ In constructing the test material, priority was given to pragmatic naturalness over segmental environments. The question ending varied: formal (-*ka* for Japanese, -*pnika* for SKK) and informal endings (-*no* for TJ, -*to* for FJ, -*eyo* for SKK) that are scope-ambiguous were used. One test sentence was modeled after Kitagawa (2005a), but modified to accord with the most natural speech style in each of the target languages. In order to examine whether discourse factors can guide the processing of wh-scope and override the wh-island effect, each question was preceded by different discourse contexts which facilitated either the matrix or embedded scope reading. One SKK test sentence in the informal style preceded by the contexts of the two scope interpretations is presented in (4.14). See Appendix B for a complete list of test sentences together with the contexts. Speaker A is the context provider (the experimenter) and B is the participant.

(4.14) Example of a test interrogative in SKK with the scope guiding contexts

a. embedded scope

A: Yumi-ka cinan thoyoil-ey salhaytanghayss-tayyo.
Yumi-Nom last Saturday-on was.killed-heard

‘I heard that Yumi was killed last Saturday’

kulentay, kunal Yumi-ka nwukwunka-lul mannassta-nuntey.
but that.day Yumi-Nom someone-Acc met-is.said

‘It is said that Yumi met someone on that day’

Kyengchal-i ce-hantey-to wassess-eyo.
police-Nom me-to-too had.come-ending

⁴ The verbs contain voiceless consonants which are not desirable for exploring pitch contours. However, recall that the types of matrix verbs which can appear in this structure are restricted. Also, they should be accented so as to show the effects of accent deletion in FJ and SKK.

‘The police came to my place, too’

B: kulayse, kyengchal-un kunal Yumi-ka **nwukwu-lul**
 so police-Top that day Yumi-Nom who-Acc
 mannassnun-ci mwuellss-eyo?
 met-Comp asked-ending

‘So, did the police ask who Yumi met on that day?’

b. matrix scope

A: Yumi-ka cinan thoyoil-ey salhaytanghayss-tayyo.
 Yumi-Nom last Saturday-Loc was.killed-heard

‘I heard that Yumi was killed last Saturday’

Kulentay, yonguyca-ka iss-ese kunal Yumi-ka
 but suspect-Nom exist-and that.day Yumi-Nom

ku salam-ul mannassnun-ci cosaha-napwayo.
 that person-Acc met-Comp investigate-seem

‘but, it seems that there is a suspect, and the police are investigating whether Yumi met him on that day.’

Kyengchal-i ce-hantey-to mwul-ule wassess-eyo.
 police-Nom me-to-too ask-in.order.to had.come-ending

‘The police came to my place in order to question me, too.’

B: kulayse, kyengchal-un kunal Yumi-ka **nwukwu-lul**
 so police-Top that day Yumi-Nom who-Acc
 mannassnun-ci mwuellss-eyo?
 met-Comp asked-ending

‘So, who is it that the police asked whether Yumi met on that day?’

Note that the test sentence which is uttered by speaker B is identical in both contexts. Yet, the scopes of the in-situ wh-phrase favored by the two discourse contexts are distinct. Most importantly, the fact that the police asked speaker A about who Yumi might have met is implied by the preceding discourse in (4.14b). This favors an interpretation of B’s question in (4.14b) where it is presupposed that the police asked, for some person x, whether Yumi met x. This presupposition in turn requires that the question be interpreted as a

matrix wh-question, asking about the identity of *x*. The written contexts were given in the script along with the test interrogatives so that subjects were able to check the contexts repeatedly.

Including four filler sentences, there were additional sentences exclusively for SKK: the same set of test interrogatives with morphological scope marker. Recall that the question ending *-na* and *-no* mark embedded scope and matrix scope, respectively.

4.2.2 Participants and recording

Three male and three female speakers participated in the recording for each language. SKK speakers were all undergraduate students at either Changwon National University or Kyeongsang National University. For TJ, three graduate students and one lecturer at Cornell University as well as two undergraduate students at the University of Tokyo were recorded. All six FJ speakers were undergraduate students at Fukuoka University. Both scope questions were recorded by each speaker; for three SKK and four TJ speakers, an interval of six months was given between the recording sessions of the two scope questions. For the rest of the speakers, questions with the distinct scope interpretations were recorded at intervals of ten minutes. The list of questions was repeated twice. The recordings were made in the sound-attenuated booths at Smyrna church in the city of Changwon for SKK, and at Cornell University or at the University of Tokyo for TJ. A quiet office at Fukuoka University was used for FJ speakers.

Speakers were asked to read the script carefully. However, I found that most speakers did not pay attention to the context I provided and uttered every phrase of the test sentences with a predetermined prosodic pattern

regardless of the context. Note that the matrix scope interpretation is not readily available without contexts that favor the reading, and the purpose of the production test was to explore the role of pragmatic/discourse contexts in relation to matrix scope questions. Thus, in order to ascertain speakers' comprehension of the contexts, I asked questions concerning the content such as 'what does/doesn't speaker A know?'. Since the context was given in the script, speakers often read it carefully again, and then answered the questions. After confirming that speakers understood the situation given, the conversation was verbally practiced; they were asked to listen to the context which was uttered by the experimenter and to read a test sentence, a potentially ambiguous wh-interrogative. Practice time lasting fifteen to twenty minutes was given in order to obtain natural utterances. Except for the comprehension questions asked to confirm the understanding of contexts, the same procedures as those in Chapter 3 were performed. See section 3.2.2 for detailed procedures.

4.2.3 Measurements

A total of 128 ($2 \text{ scopes} \times 2 \text{ endings} \times 4 \text{ sets} \times 4 \text{ speakers} \times 2 \text{ repetitions}$) test sentences for each language were analyzed.⁵ The data were digitized with a 22,050 Hz sampling rate and 16-bit quantization. Labeling and measurements were made using Praat version 5.0.03. Phrase boundaries were manually marked on each utterance. In measuring fundamental frequencies, both peak and valley F0s of each phrase were extracted. The labeling and measurements are illustrated in Figure 4.1. The figure shows the pitch contour

⁵ One male speaker of FJ (FJM0) did not accept the matrix scope interpretation. Thus, he was not recorded for matrix scope questions.

of an embedded scope question uttered by a female speaker of TJ (TJF2). The final rising boundary tone (H%) is excluded as it often reaches a higher F0 than the F0 peak of the accented mora in matrix verbs. Crucial points are marked by arrows. A modifier is indicated by 'mod'.

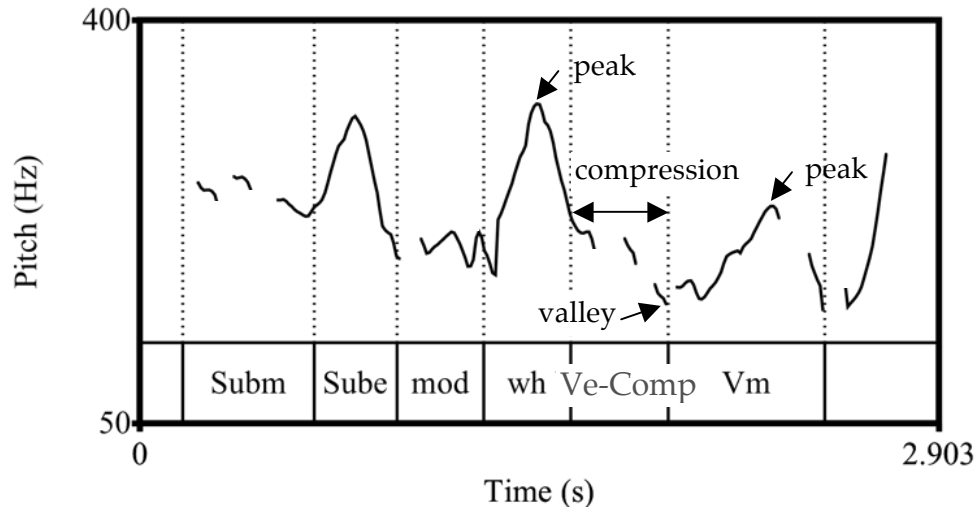


Figure 4.1. Example of annotation and measurements

The wh-phrase and the following embedded verb in Figure 4.1 demonstrate the expected prosodic wh-scope marking; The F0 peak of the wh-phrase is raised, and that of the embedded verb is compressed. Yet, the compression does not continue to the matrix verb. In determining how to effectively compare F0 contours of questions taking distinct scope, F0 contours of scopally ambiguous questions were overlapped. As distinct phonetic implementations were observed—high plateaus and F0 compression—it is necessary to examine the two prosodic patterns separately. I first consider the wh-intonation characterized by F0 compression before turning to the high plateau type.

Figure 4.2 presents overlapped F0 contours of a matrix and an

embedded question uttered by a male speaker of SKK (SKKM1). Recall that *nwukwu* ‘who’ in SKK can yield the F0 compression pattern if it is produced as a falling tone. The wh-phrase of the matrix question exhibits a somewhat higher F0 peak than that of the embedded question. A more appreciable difference is observed in the F0 peaks of the matrix verbs; the F0 peak of the matrix verb in the embedded question is approximately 37 Hz higher than that in the matrix question.

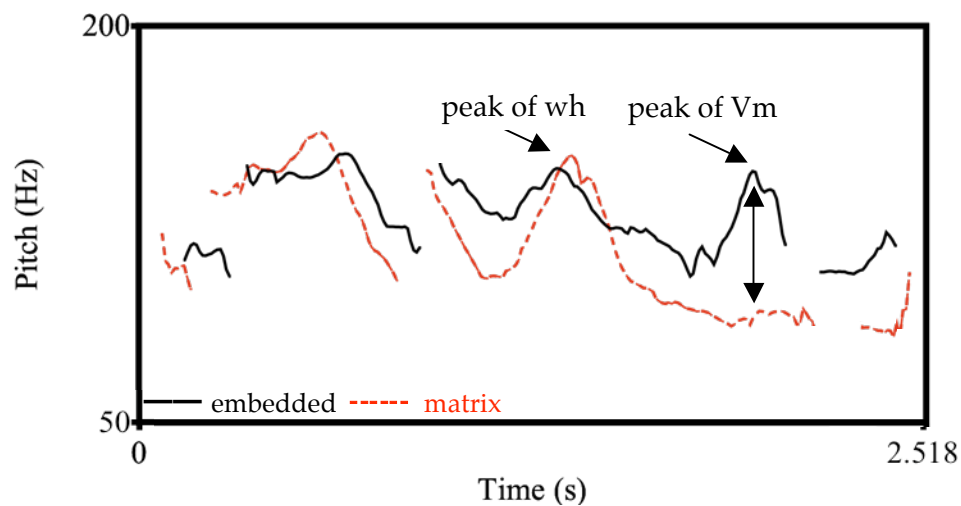


Figure 4.2. F0 contours of F0 compression in SKK

Yet, a somewhat different pattern is observed in other utterances. Figure 4.3 shows the F0 contours of a matrix and an embedded scope question uttered by a male speaker of FJ (FJM2). In the utterance below, the wh-phrase in the matrix scope question exhibits a markedly higher F0 peak than that in the embedded scope question. On the other hand, no substantial difference is observed between the F0 peaks of the matrix verbs because the matrix verb of the embedded question is already quite compressed.

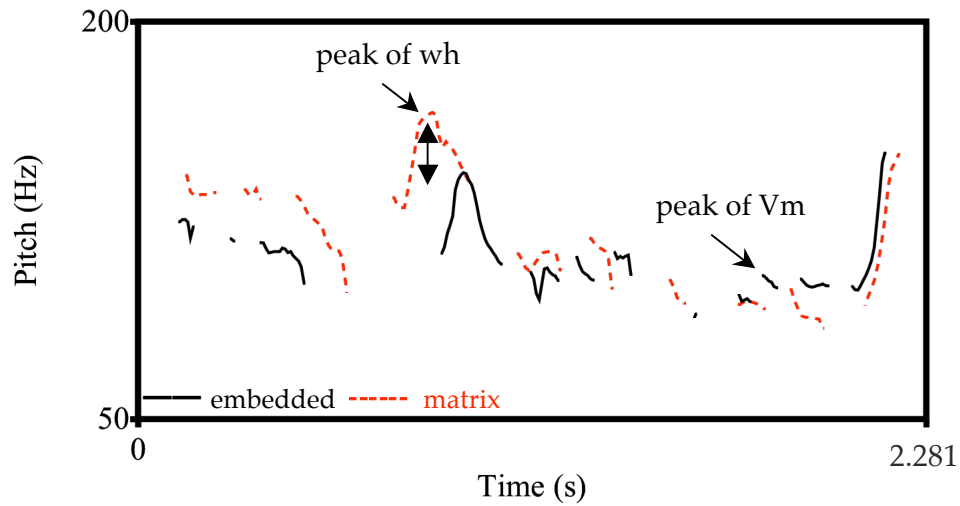
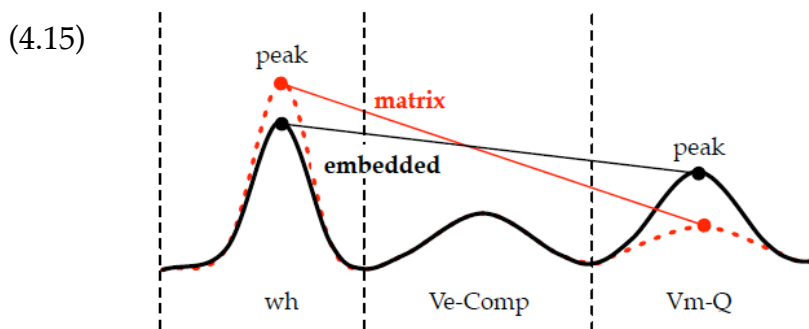


Figure 4.3. F0 contours of F0 compression in FJ

This pattern is in accordance with the results reported by Hirose and Kitagawa (2007). Two among the four subjects in the production test yielded significantly higher F0 peaks for wh-phrases in matrix scope questions than for those in embedded scope questions. This speaker difference is taken up in §4.4. Consider the expected results of the F0 compression pattern schematized in (4.15).



Thus for the F0 compression pattern of prosodic scope marking, F0 differences between wh-phrases and matrix verbs were compared across the two scope conditions.

In contrast, the prosodic scope marking involving a high plateau exhibits more consistent patterns. Figure 4.4 and Figure 4.5 show F0 contours of scopally ambiguous questions uttered by a female speaker of FJ (FJF2) and a female speaker of SKK (SKKF2), respectively. In both figures, the two contours start diverging at the embedded Comp as marked by a circle; a discrete falling tone is observed in the embedded question whereas high plateau continues in the matrix question.

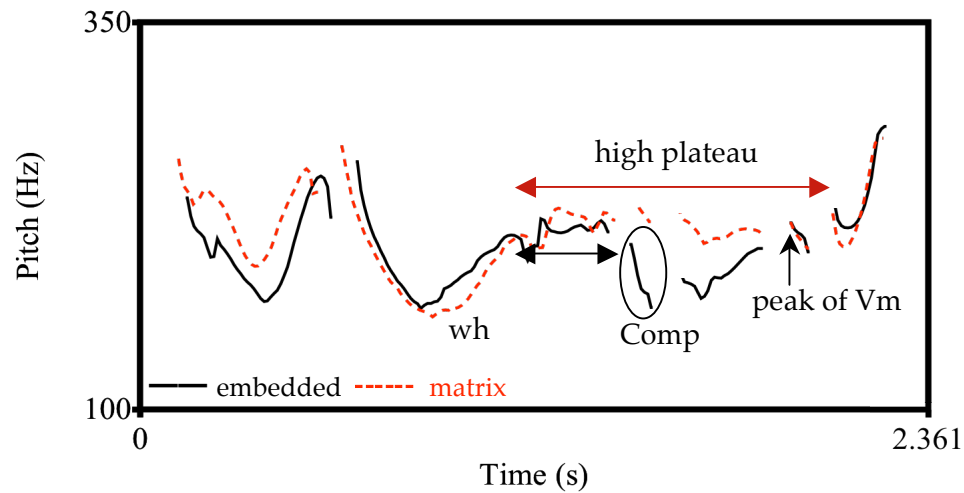


Figure 4.4. F0 contours of the high plateau in FJ

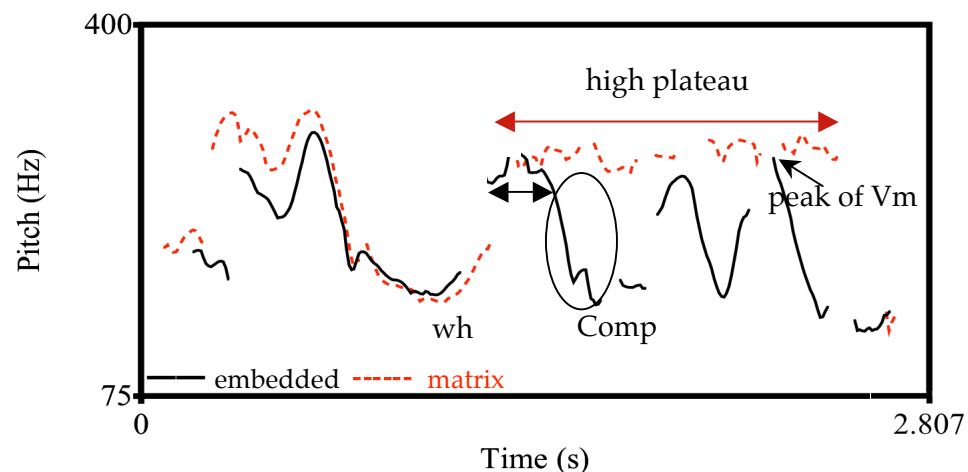
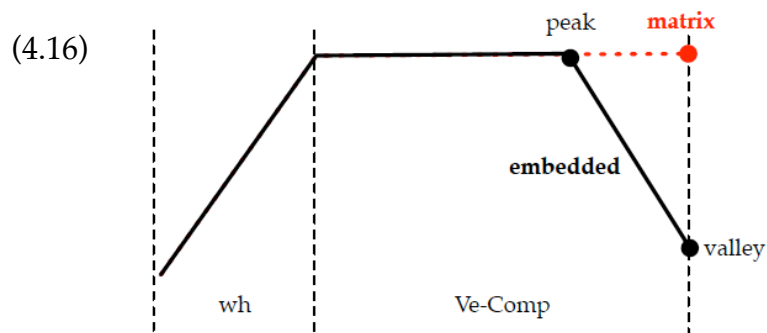


Figure 4.5. F0 contours of the high plateau in SKK

Notice that the F0 peak of the matrix verb in the embedded question exhibits a similar F0 value to the height of the high plateau, showing that F0 peaks of matrix verbs are not informative as a point of comparison. Instead, primary F0 differences between the distinct questions are observed in embedded verb phrases as schematically illustrated in (4.16).



Thus, the F0 change ($F0 \text{ peak} - F0 \text{ valley}$) in the embedded verb phrase was compared across the two scope conditions for the high plateau type in SKK and FJ. The results are presented in the following section.

4.2.4 Results

The results for each language—TJ, FJ, and SKK—will be presented in turn. I compare F0 changes between *wh*-phrases and matrix verbs for the F0 compression type, and then turn to F0 changes in embedded verb phrases for the high plateau type in FJ and SKK.

Mean F0 changes in TJ are graphically presented in Figure 4.6. As all tokens exhibited the F0 compression pattern in this language, results of sixty-four questions for each *wh*-scope were pooled.

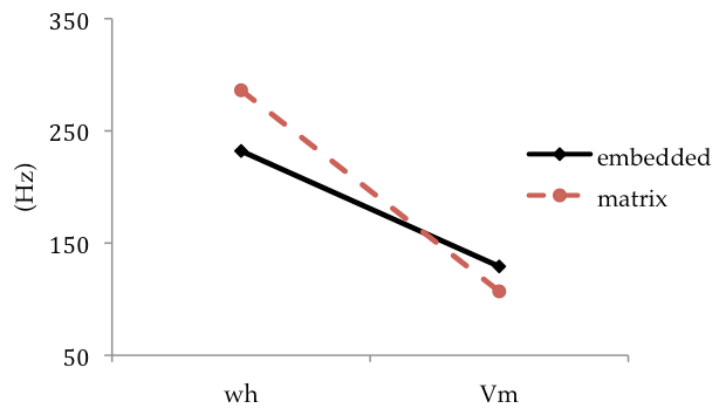


Figure 4.6. Mean F0 change between the wh-phrase and matrix verb in TJ

As illustrated above, considerable differences are observed both in wh-phrases and matrix verbs; The F0 peak of a wh-phrase is raised and that of a matrix verb is compressed in matrix questions compared to those in embedded questions. Paired T-tests indicate that F0s of wh-phrases, matrix verbs and F0 changes are significantly different between the questions of distinct wh-scope ($t(1,126)=-13.67$, $p<.0001$ for wh-phrases, $t(1,126)=8.21$, $p<.0006$ for matrix verbs, $t(1,126)=-17.99$, $p<.0001$ for F0 changes).

Given the possibility of speaker differences in the production of wh-intonation for TJ (Hirose and Kitagawa 2007), it is necessary to consider the results of each speaker separately. Figure 4.7 shows the results of each speaker in TJ.

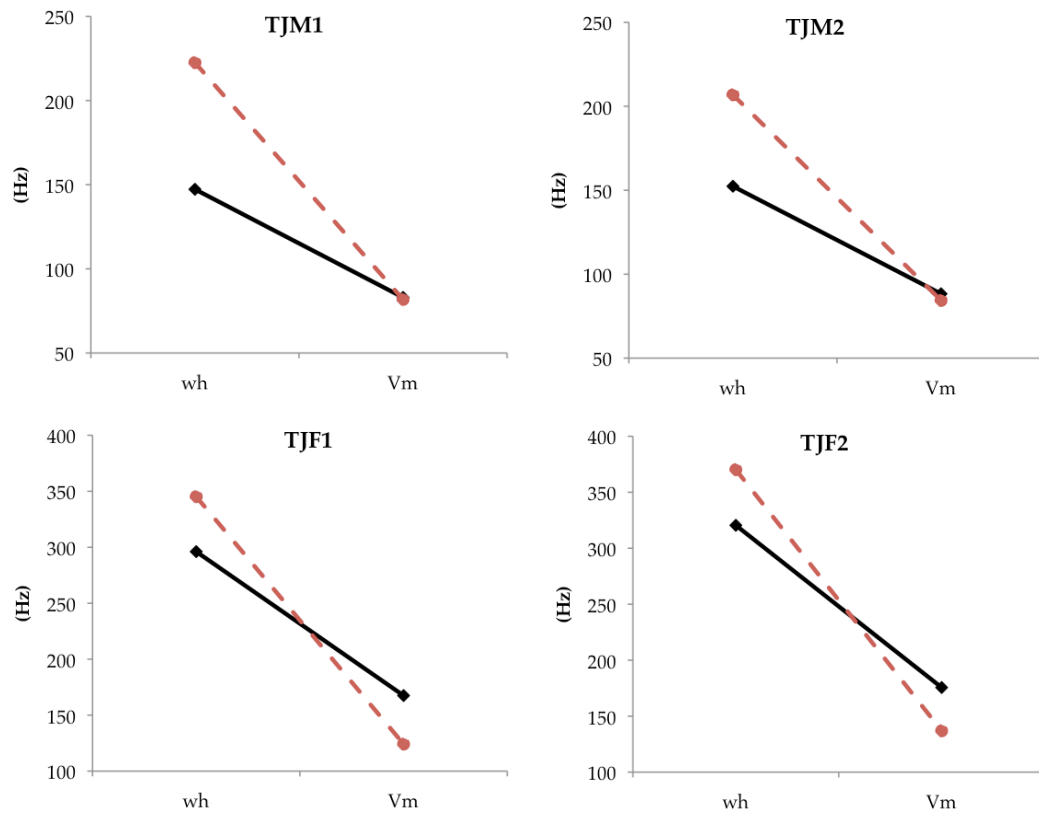


Figure 4.7. Mean F0 change between the wh-phrase and matrix verb in TJ for individual speakers

While two of the speakers (TJF1, TJF2) yield appreciable F0 differences both in wh-phrases and matrix verbs, the other two (TJM1, TJM2) exhibit quite comparable F0 peaks in matrix verbs regardless of wh-scope. The results of statistical analyses are summarized in Table 4.3 separated by speaker.

Table 4.3. Results of paired t-test for each speaker in TJ

speaker	variables	t-value (1,30)	p-value
TJM1	wh peak F0	-9.60	p<0.0001*
	Vm peak F0	2.82	p=0.0194*
	F0 change	-11.66	p<0.0001*
TJM2	wh peak F0	-8.76	p<0.0001*
	Vm peak F0	1.53	p=0.1476
	F0 change	-9.11	p<0.0001*
TJF1	wh peak F0	-5.47	p<0.0001*
	Vm peak F0	11.81	p<0.0001*
	F0 change	-10.27	p<0.0001*
TJF2	wh peak F0	-7.00	p<0.0001*
	Vm peak F0	10.43	p<0.0001*
	F0 change	-11.70	p<0.0001*

As indicated in Table 4.3, paired t-tests confirm that the peak F0s of wh-phrases (wh peak F0) and F0 change are significantly different between embedded and matrix scope across speakers. However the peak F0 difference for matrix verbs (Vm peak F0) between the distinct wh-scope questions is not statistically significant for speaker TJM2. This finding is similar to the results reported by Hirose and Kitagawa (2007), namely that for some speakers, F0 peaks of matrix verbs in matrix questions are not notably more compressed compared to those in embedded scope questions.

For FJ, the F0 compression pattern was produced by a male speaker (FJM2) in four and eight tokens for embedded and matrix questions, respectively. Mean F0 peaks of wh-phrases and matrix verbs are graphically presented in Figure 4.8.

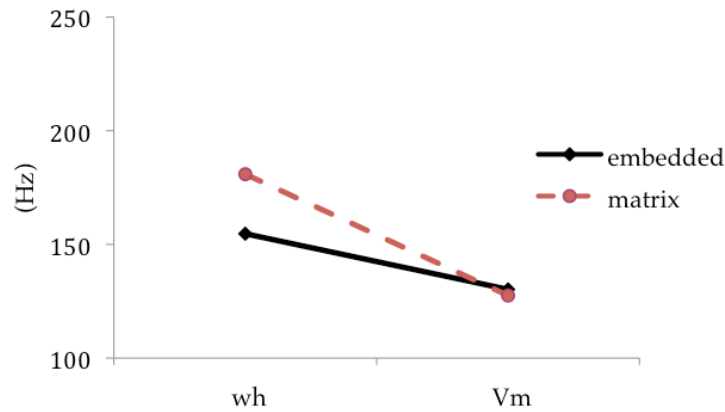


Figure 4.8. Mean F0 change between the wh-phrase and matrix verb in FJ

As is clear in Figure 4.8, this speaker patterns together with the male speakers of TJ in that a noticeable F0 difference is observed only in wh-phrases, not in matrix verbs. Statistical significance was not tested since the number of tokens obtained for this prosodic pattern in FJ was not enough for a statistical analysis.

Before presenting the results for SKK, it should be noted that one utterance produced by this speaker of FJ exhibited a prosodic pattern that went against the generalization: the combination of a wh-phrase with a rising tone and F0 compression. This unexpected prosodic pattern seems to suggest the prosodic system in FJ is changing, presumably due to the pervasive influence of TJ, the standard variety of Japanese. It is noteworthy that in embedded scope questions, no accent deletion in the embedded verbs was found as the accented mora exhibited a falling tone indicating the absence of accent loss, as discussed in §2.3.

A more robust difference between the two scope questions was observed in SKK. Eleven embedded and sixteen matrix questions uttered by speakers SKKF1 and SKKM2 yielded the pattern of F0 compression. The mean

F0 changes in this language are graphically manifested below.

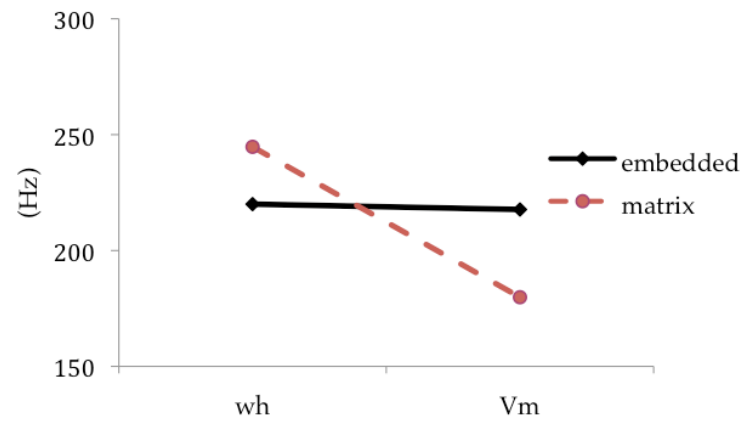


Figure 4.9. Mean F0 change between the wh-phrase and matrix verb in SKK

In SKK, matrix questions exhibit considerably greater F0 peaks of wh-phrases and lower F0 peaks of matrix verbs, compared to embedded questions. Interestingly, the F0 peak of matrix verbs in embedded questions is noticeably higher than that in matrix questions, reaching an F0 nearly comparable to that of wh-phrases. These high F0 peaks of matrix verbs in embedded questions differentiate SKK from TJ or FJ. Recall that matrix verbs even in embedded questions were quite compressed in TJ and FJ. Again, statistical analyses were omitted due to the limited number of tokens.

Turning to the high plateau type, FJ and SKK showed similar results as graphically presented in Figure 4.10. As no between-speaker effect was observed, further analysis was performed on the pooled averages for all speakers. Figure 4.10 graphically represents the mean F0 changes observed in embedded verbs.

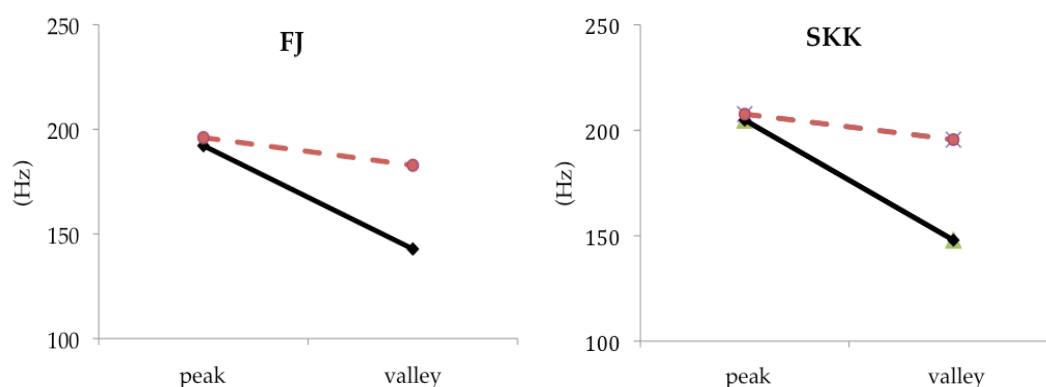


Figure 4.10. F0 change in embedded verb phrases in FJ (left) and SKK (right)

In both languages, a substantial F0 drop is exhibited in embedded questions whereas no appreciable F0 drop is observed in matrix questions. The statistical significance of this observation is confirmed by t-tests as summarized below.

Table 4.4. Results of t-test for high plateau in FJ

variables	t-value (1,114)	p-value
peak F0	-1.16	p=0.25
valley F0	-3.52	p=0.0006*
F0 change	7.79	p<0.0001*

Table 4.5. Results of t-test for high plateau in SKK

variables	t-value (1,99)	p-value
peak F0	-0.2	p=0.85
valley F0	-3.59	p=0.0006*
F0 change	10.47	p<0.0001*

In sum, when plausible contexts were given, matrix scope interpretations were largely acceptable, and distinct scope readings yielded phonetically different intonation patterns marking the semantic scope of wh-phrases. The prosodic wh-scope marking attested in the languages at issue

supports Kitagawa's argument that the matrix reading is not ungrammatical but disfavored. However, not all speakers accepted the matrix reading even when the matrix-favoring context was given. Thus, contextual plausibility does not seem to be the only factor responsible for the bias against the matrix interpretation.

While the prosodic patterns were robust and consistent across speakers in SKK, considerable speaker differences were found in the production of wh-intonation in TJ and FJ. Further, some anomalies of wh-intonation were observed in FJ. It is conceivable that these speaker differences and anomalies in production could affect the comprehension of wh-scope. Thus, in the following section, we turn to the role of prosody in the resolution of scope ambiguities.

4.3 Comprehension test: off-line listening experiments

Comprehension tests were conducted in order to investigate the role of wh-intonation with respect to wh-scope in scope-ambiguous wh-interrogatives. Specifically, the experiments were designed to test if the matrix scope interpretation is available when prosodic marking signals that reading. In exploring the prosodic effect without the influence of pragmatic plausibility, no specific context was provided. The effect of the distinct prosodic patterns, the high plateau and F0 compression, was also examined.

4.3.1 Stimuli

A subset of the interrogatives recorded in the production test were utilized. In selecting stimuli, priority was given to utterances naturally articulated at a comfortable rate of speech. Also, phonetic implementation of

the prosodic scope marking was considered, with an effort made to include both high plateau and F0 compression patterns in FJ and SKK. Across the languages, test sentences together with fillers were tested in four sessions, each of which contained an equal number of stimuli. In each session, eight test stimuli (four for each reading) and twelve fillers were tested in a random order. However, the stimuli were presented in an identical order for all participants.

In regards to the prosodic patterns of the stimuli, all test stimuli exhibited F0 compression in which the right edge was aligned with the Comp that the wh-phrase was associated with. As shown in the previous section, the phonetic details of the F0 compression pattern in TJ and FJ were different depending on the speaker. Thus, both types of F0 compression were included among the stimuli for those languages. For FJ and SKK, both surface realizations of wh-intonation were tested. It is worth reiterating that prosodic differences between distinct scope questions in FJ was not as clear as in SKK. Recall that signs of a change-in-progress were observed in the prosodic system of FJ when we discussed the results of the production tests. In particular, one embedded scope question produced by a male speaker (FJM2) showed conflicting cues; a high plateau for the embedded scope as well as F0 compression of the matrix verb. The pitch contour of the stimulus is presented in Figure 4.11.

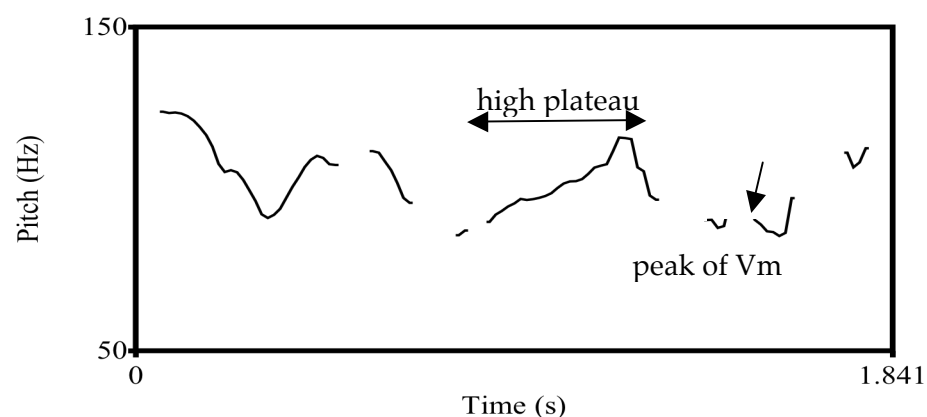


Figure 4.11. Pitch contour of an embedded scope question in FJ exhibiting conflicting cues

The wh-intonation in Figure 4.11 is rather incomplete, for the following reason: it is realized as a gradual F0 rising with an immediate fall after the accented mora of the embedded verb, which is the pervasive realization of the high plateau for embedded scope questions in FJ. However, as indicated by an arrow, the F0 of the matrix verb is quite compressed. This token is illuminating in that conflicting cues are observed in a single stimulus; while the high plateau whose right edge is aligned with the embedded Comp signals embedded scope, F0 compression of the matrix verb is the cue for a matrix scope reading. If listeners utilize only the scope marking of high plateau for scope disambiguation, this stimulus is expected to render high percentages of embedded interpretation. On the other hand, if the F0 excursion size of the matrix verbs is a crucial cue for listeners, the stimulus could be interpreted as a matrix question. In cases where listeners are sensitive to both cues, quite a low rate of accuracy for scope assignment and long response times are expected. It turns out that this stimulus did indeed yield substantially lower rates of accuracy than other stimuli. This issue will be taken up in §4.3.3.

asked. This was done to exclude the possibility that they would choose the identity answer even after assigning an embedded wh-question interpretation, as an identity answer implies a ‘yes’ answer to an embedded question while providing further information. For instance, in Japanese and Korean, when one is asked whether he watched something, it is not unnatural to answer ‘a movie’, omitting ‘yes’. Also, I informed the Japanese participants that the stimuli were recorded by native speakers of their dialect for the sake of minimizing potential bias that they could possibly have due to the fact that the experimenter was not a native speaker of Japanese. It seems that this information quite successfully eliminated the bias, as most participants stated that the stimuli were naturally uttered after completing the test.

4.3.3 Results and discussion

In this section, results of wh-scope assignment and response times I obtained from twenty-nine speakers of TJ, twenty-five speakers of FJ, and thirty-two speakers of SKK are presented. Results of five FJ participants had to be discarded as they randomly chose answers yielding less than 20% of correct answers for both scope readings. Also, response times exceeding 10,000 milliseconds were excluded as outliers. Discarding the outliers rendered 463 (embedded) and 458 (matrix) results in TJ, and 398 (embedded) and 425 (matrix) in FJ. In SKK, 512 responses were further analyzed for each scope reading.

4.3.3.1 Effect of wh-intonation on wh-scope assignment

In order to investigate whether the prosodic scope marking manifested in production also guides listeners’ comprehension of wh-scope, percentages

of the embedded scope reading were calculated for each prosody pattern. Figure 4.12 shows the percentages of the embedded reading (%Emb) for each the prosody pattern of the stimuli, averaged for all participants for TJ.

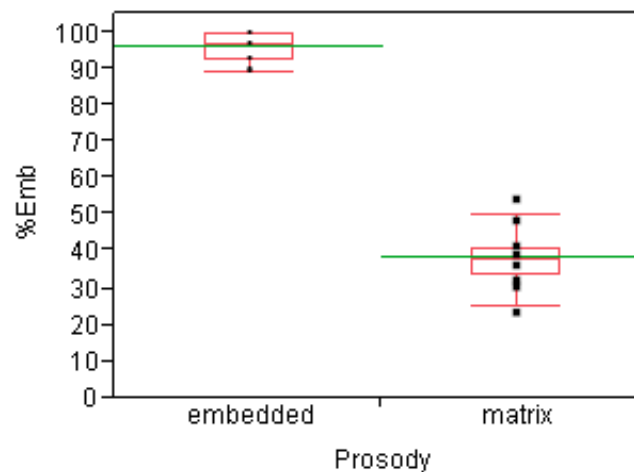


Figure 4.12. Percentage of the embedded reading by prosodic pattern in TJ

As shown above, the percentage of the embedded scope reading was remarkably lower when prosody indicating matrix scope was given. A t-test confirmed that the prosodic effect is significant in wh-scope assignment ($t(1,30)=27.72, p<.0001^*$).

In order to examine which acoustic parameters are correlated with the comprehension of wh-scope, scatterplots were generated in which percentages of the embedded reading (%Emb) were plotted against peak F0s of wh-phrases, peak F0s of matrix verbs and F0 changes between wh-phrases and matrix verbs. Figure 4.13 illustrates scatterplots of %Emb in TJ with fitted curves.

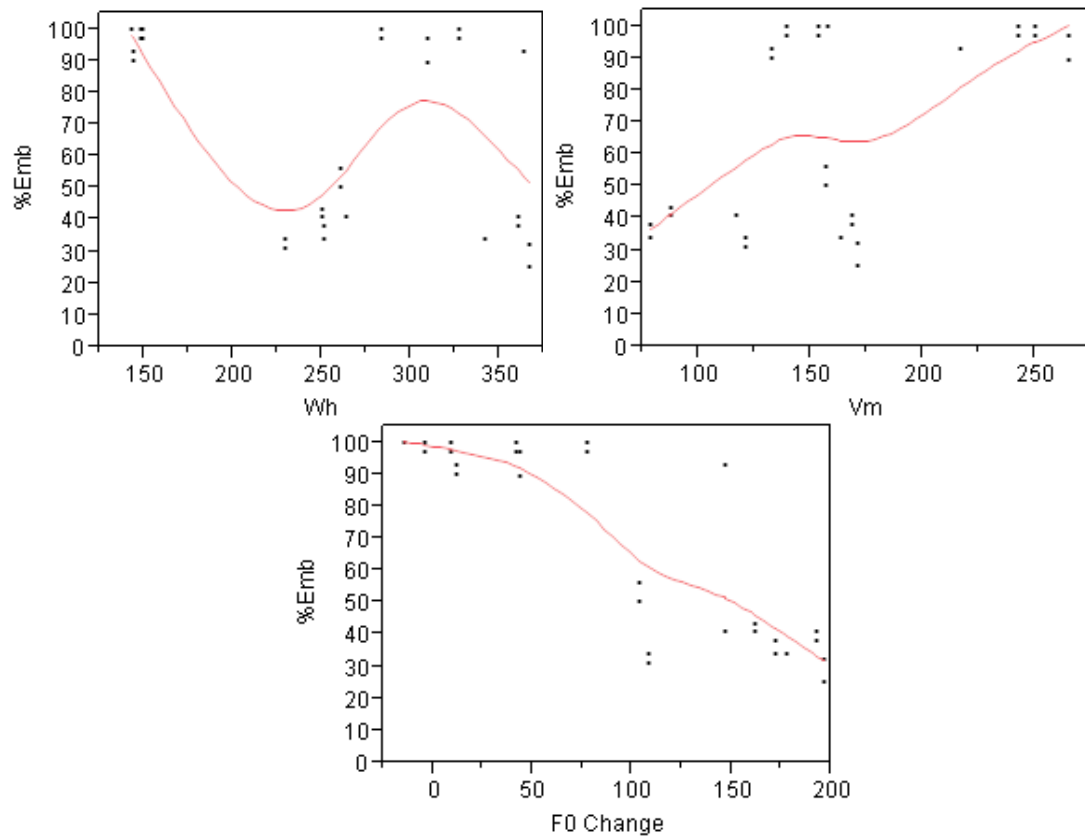


Figure 4.13. Scatterplots of percentage of the embedded reading against wh peak F0 (top left), V_m peak F0 (top right) and F0 change (bottom), with spline fits for TJ

The scatterplots in Figure 4.13 suggest that percentages of the embedded reading (%Emb) are not strongly correlated with peak F0s of wh-phrases ($R^2=0.5879$) or with peak F0s of matrix verbs ($R^2=0.4055$). Yet, the plot of %Emb against F0 changes reveals a substantial correlation between those two variables ($R^2=0.7540$). Overall, the correlations with the acoustic variables were quite weak, with the F0 changes having the greatest R^2 value. As we shall see, the R^2 values yielded in TJ were notably smaller than those in FJ or SKK, implying that speakers of FJ and SKK are more sensitive to these prosodic cues.

With respect to response times, similar results were found. A boxplot

presents response times (RT) depending on the prosodic pattern of the stimuli.

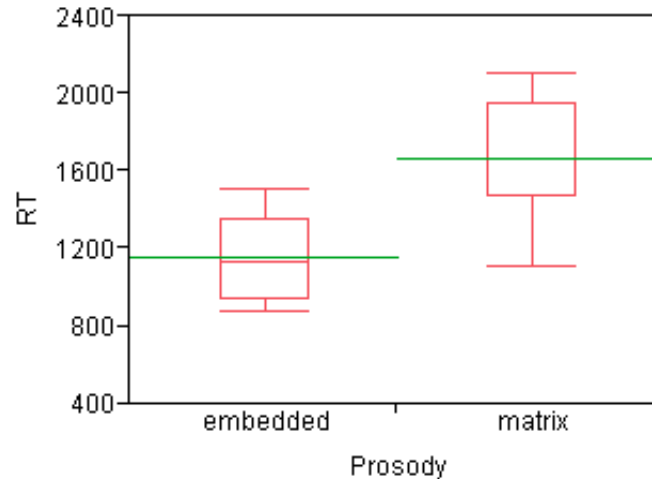


Figure 4.14. Response time (ms) by prosodic pattern in TJ

A t-test indicated that response times for the prosodic marking of matrix scope were significantly longer than those for the prosodic marking of embedded scope ($t(1,30)=5.44$, $p<.0001^*$). However it is necessary to separate the results above by the response of scope assignment since prosodic marking did not completely distinguish wh-scope as presented in Figure 4.12. Mean response times depending on stimulus prosody pattern and response are summarized in Table 4.6.

Table 4.6. Mean response times (ms) by response and prosodic pattern in TJ

Prosody \ Response	Response	
	embedded	matrix
embedded	1131	1932
matrix	1366	1856

In general, matrix scope readings yielded considerably longer response times

than embedded scope readings regardless of the prosody of the stimuli. Also, notice that correct answers were given more quickly than incorrect answers in both patterns of wh-scope.

It is not surprising that the matrix scope reading requires longer response times. There has been a great deal of evidence that longer wh-dependencies, *i.e.* the matrix scope reading in this case, involve a greater processing load (Gibson 1998, 2000, Hawkins 1999, Arnon et al. 2005, Phillips et al. 2005 among others). Also, this finding is in accord with the results of self-paced reading studies in Japanese (Miyamoto and Takahashi 2002, Aoshima et al. 2003), in which readers slowed down on the region of an embedded verb phrase if the embedded Comp was not associated with a preceding wh-phrase, yielding a matrix scope reading. Recall that Hirotani (2005) reports the interesting results of listening time and response time introduced in Table 4.2. As mentioned earlier, those data cannot be directly compared with the results of the current study due to the distinct methods of measurement. In particular, the prosodic conditions in her study are not strictly comparable to those in the present experiment, which are prosodic patterns of embedded or matrix scope. Nevertheless it is worth mentioning those results here as they are from the only previous study that measured response times. For the sake of comparison, I added up the listening time and response times in Hirotani (2005)'s data. Also, in observing the representative pitch contours of the four conditions, it seems that conditions B (Boundary, Pitch Compression) and D (No Boundary, Pitch Compression) correspond to the prosodic patterns marking embedded and matrix scope of the present study, respectively. The results are summarized in Table 4.7.

Table 4.7. Response times (ms) by response and prosodic condition B and D of Hirotsu (2005)

Response \ Prosody	embedded	matrix
embedded	2769	3005
matrix	2889	2941

As the methodology was different, absolute response time cannot be compared. Yet, it is obvious that response times for matrix responses are relatively longer than the embedded responses regardless of the prosodic condition. Similar with the current finding, the matrix response by prosody of embedded scope yielded the longest response time. However, matrix response by matrix scope prosody (2941 ms) took slightly longer than embedded response by matrix scope prosody (2889 ms), contrary to the result of the present experiment. This may result from the large between-speaker differences in accepting the matrix scope interpretation observed in TJ and FJ, a topic which will be discussed in §4.3.3.4.

For FJ, a substantial effect of prosody on the disambiguation of wh-scope was observed as graphically presented in Figure 4.15.

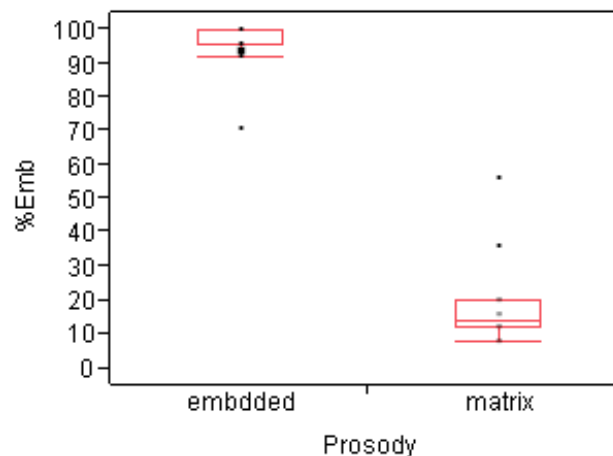


Figure 4.15. Percentage of the embedded reading by prosodic pattern in FJ

As shown above, the percentage of the embedded scope reading was remarkably lower when prosody indicating matrix scope was given. A t-test showed that the percentages of the embedded scope reading are significantly different between the prosodic conditions of the stimuli ($t(1,30)=20.5512$, $p<.0001^*$).

Subsequent statistical analyses of regression were performed separately for the phonetic implementation of the prosodic wh-scope marking. Scatterplots of the percentage of the embedded reading for the F0 compression pattern is provided before turning to those for the high plateau pattern. Figure 4.16 illustrates scatterplots of %Emb against peak F0 of wh-phrases, peak F0 of matrix verbs and F0 changes.

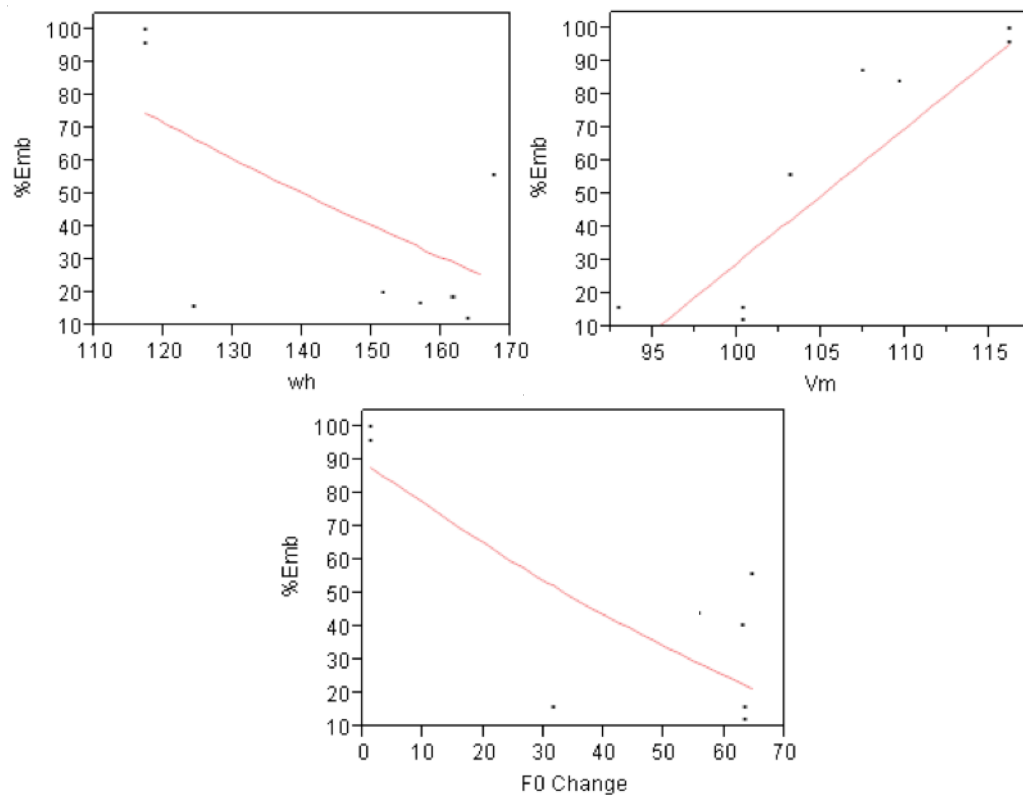


Figure 4.16. Scatterplots of percentage of the embedded reading against wh peak F0 (top left), V_m peak F0 (top right) and F0 change (bottom), with a spline fit for FJ

It appears that there is no strong relationship between the percentage of the embedded reading and peak F0s of wh-phrases ($R^2=0.3969$). Yet, %Emb is strongly correlated with peak F0s of matrix verbs ($R^2=0.8788$). It seems that peak F0s of matrix verbs are the crucial prosodic cue for FJ speakers to disambiguate wh-scope when the F0 compression pattern is given. Also, the fitted line of %Emb against F0 changes suggests that they are quite strongly correlated ($R^2=0.6599$).

Turning to the high plateau pattern, scatterplots of %Emb against the peak and valley F0s of embedded verbs and F0 changes are provided in Figure 4.17.

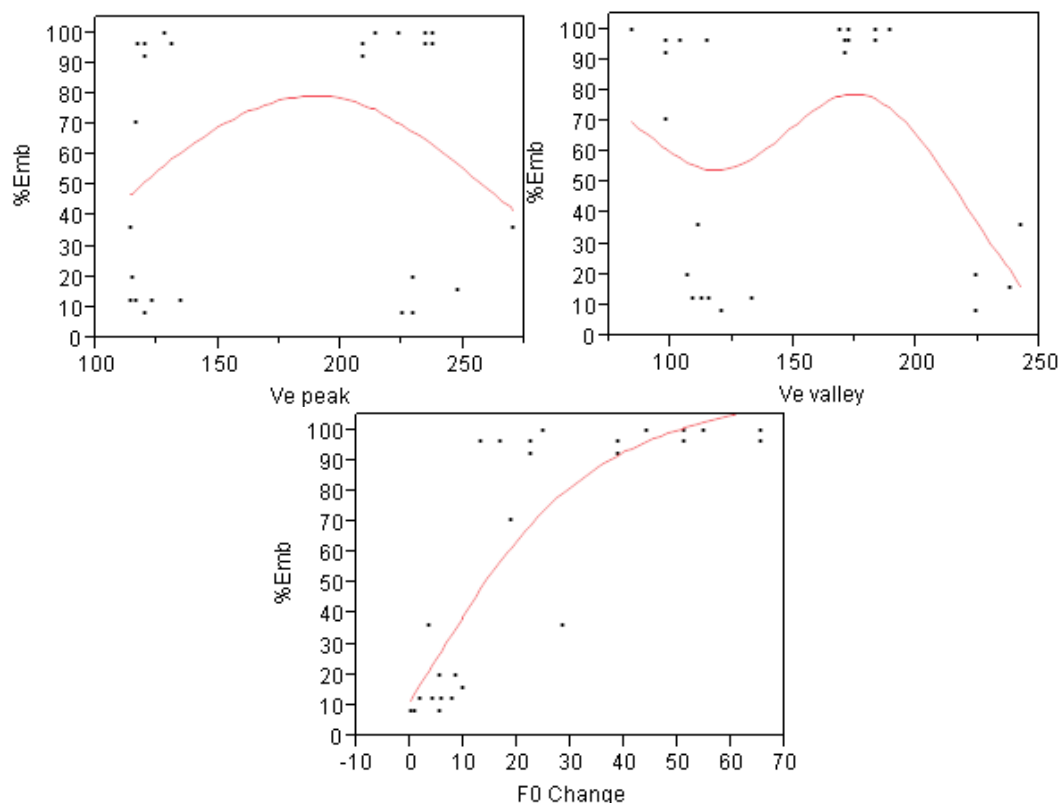


Figure 4.17. Scatterplots of percentage of the embedded reading against V_e peak F0 (top left), V_e valley F0 (top right) and F0 change (bottom), with a spline fit for FJ

As illustrated above, the effect of peak F0s of embedded verbs on %Emb was clearly small ($R^2=0.1039$). The fitted line of %Emb against valley F0s of embedded verbs suggests a weak correlation between those variables ($R^2=0.4337$). However the plot reveals that %Emb is fairly strongly correlated with F0 changes when the high plateau pattern is given ($R^2=0.7552$).

With respect to the response times, listeners responded more quickly when the prosodic pattern indicating embedded scope was provided as shown in Figure 4.18.

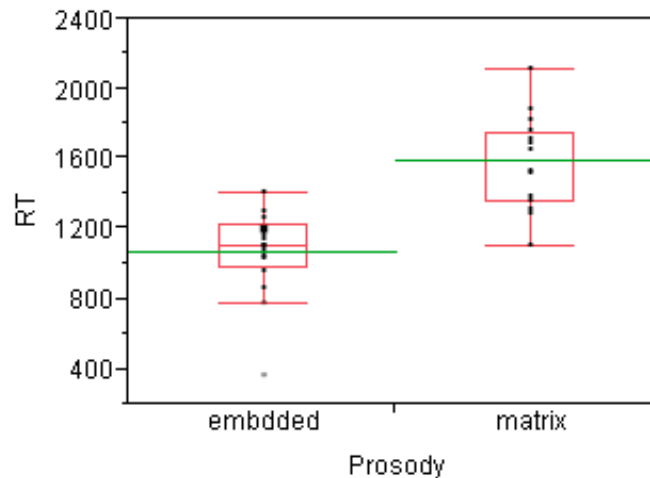


Figure 4.18. Response time (ms) by prosodic pattern in FJ

A t-test indicated that there is a significant difference in response times between the distinct prosodic patterns depending on wh-scope ($t(1,30)=5.8719$, $p<.0001^*$). In comparing the results of response time separately by response type, quite different tendencies from the TJ results were observed. Table 4.8 presents the averaged response times depending on input prosodic pattern and response type.

Table 4.8. Mean response times (ms) by response and prosodic pattern in FJ

Prosody \ Response	embedded	matrix
	embedded	matrix
embedded	1098	1586
matrix	1703	1526

The response time when embedded scope prosody was given and embedded responses were chosen (1098 ms) was remarkably shorter than the other combinations of input prosodic patterns and response types. This result is not surprising if we consider that embedded wh-scope and the corresponding prosodic pattern are preferred over the matrix scope interpretation. Interestingly, however, the embedded response when matrix scope prosody was given yielded the longest response time. Thus, unlike TJ, there was no strong tendency for matrix scope responses to require longer response times than their embedded counterparts. Also, when matrix scope readings were chosen, the correct and incorrect responses yielded similar response times. As we shall see later, this result is quite different from that in SKK.

SKK exhibited the most consistent results among the languages at issue. Percentages of embedded scope reading (%Emb) averaged for all participants of SKK are illustrated below.

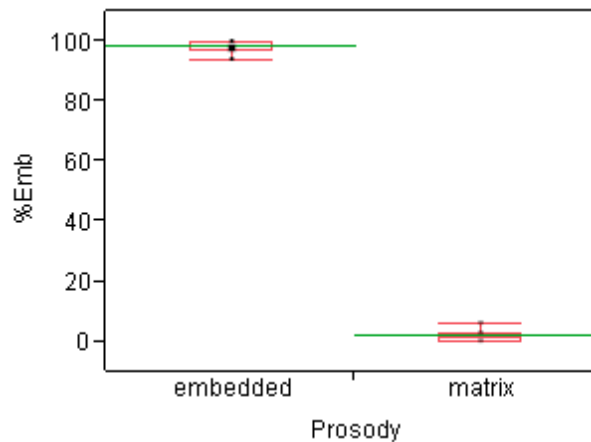


Figure 4.19. Percentage of the embedded reading by prosodic pattern in SKK

As shown in Figure 4.19, the percentage of the embedded scope reading was remarkably lower when prosody indicating matrix scope was given. Notice that the deviances are much smaller compared to those in TJ or FJ. A t-test showed that the effect of the prosodic scope marking is significant in disambiguating wh-scope ($t(1,30)=134.474$, $p<.0000^*$). Notice that ambiguous wh-scope was nearly perfectly disambiguated by the prosodic cue of scope marking in this language.

In examining the acoustic correlates of scope assignment when F0 compression was exhibited, scatterplots of percentage of the embedded scope reading were plotted against peak F0 of wh-phrases, peak F0 of matrix verbs and F0 changes. Overall, all the acoustic parameters in SKK exhibited greater R^2 values compared to those in TJ or FJ.

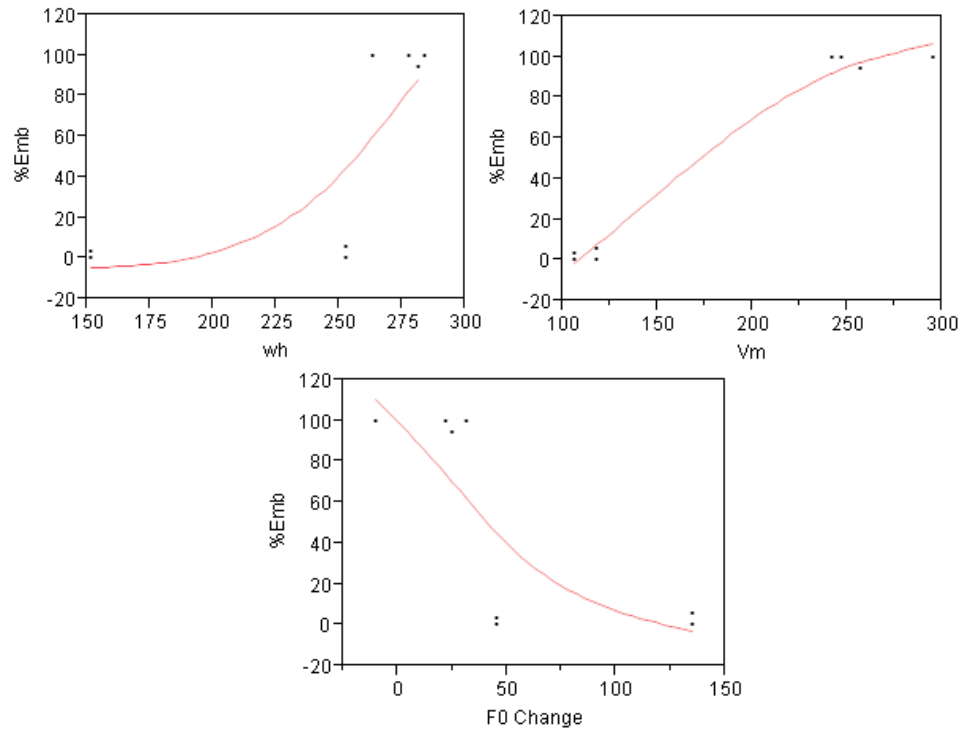


Figure 4.20. Scatterplots of percentage of the embedded reading against wh peak F0 (top left), V_m peak F0 (top right) and F0 change (bottom), with a spline fit for SKK

The scatterplot suggests quite a strong relationship between the percentage of the embedded reading (%Emb) and peak F0s of wh-phrases ($R^2=0.6996$). Also, the correlation between %Emb and peak F0s of matrix verbs was remarkably strong ($R^2=0.9873$). The fitted line of %Emb against F0 changes accounted for more than 64 % of the distribution ($R^2=0.6414$).

The very strong correlation between scope assignment and peak F0s of matrix verbs in SKK conforms surprisingly well to the prediction of the prosodic scope marking of F0 compression. Recall that differences between wh-questions of distinct scope are expected to be observed in peak F0s of matrix verbs in the case of the F0 compression pattern for the construction at issue. It is worth noting that acoustic differences between the two readings

were better realized in the stimuli of SKK; SKK speakers consistently produced substantial F0 differences on matrix verbs depending on the wh-scope of the question. Given the completely distinct acoustic cues and the remarkably large R^2 value for peak F0s of matrix verbs in SKK, it is not surprising that SKK participants distinguished wh-scope based solely on the prosodic cue of F0 compression with a high rate of success.

Turning to the high plateau pattern, consider the scatterplots of percentage of the embedded reading (%Emb) against the peak and valley F0s of embedded verbs and F0 changes provided in Figure 4.21.

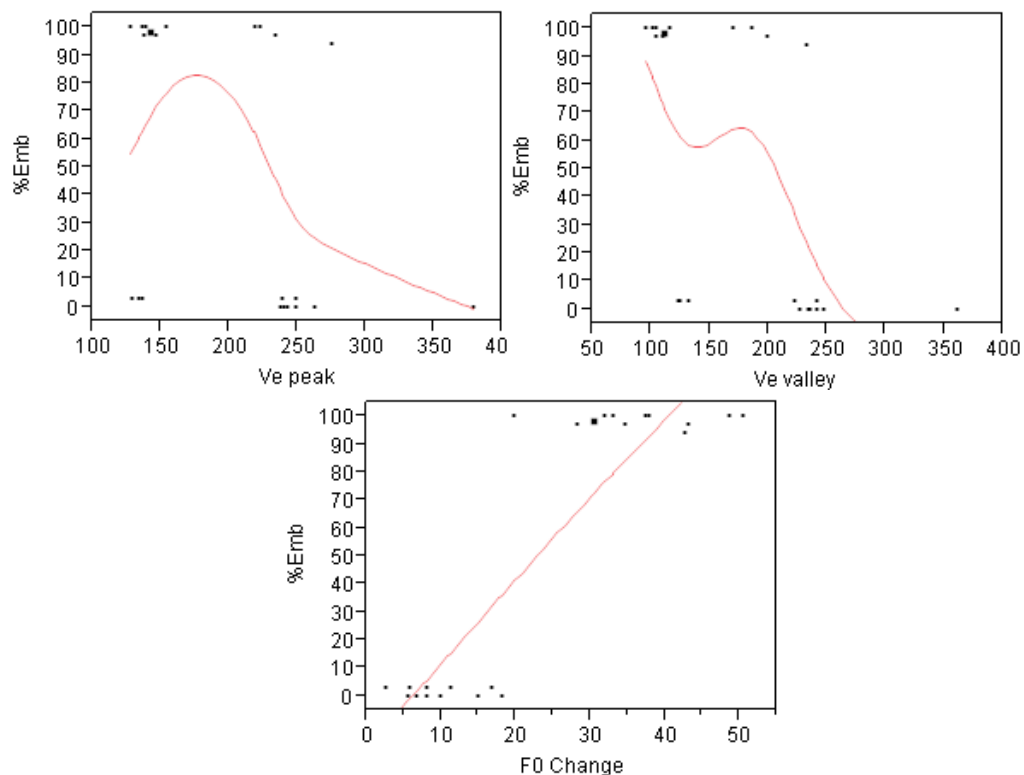


Figure 4.21. Scatterplots of percentage of the embedded reading against V_e peak F0 (top left), V_e valley F0 (top right) and F0 change (bottom), with a spline fit for SKK

Overall, the results of regression analyses in SKK patterned together with those in FJ for the high plateau type, with SKK yielding high R^2 values across the acoustic variables. The fitted line of percentages of the embedded scope reading (%Emb) against peak F0s of embedded verbs does not account for the distribution ($R^2=0.2612$). The scatterplot of %Emb against valley F0s of embedded verbs suggests a weak correlation between the variables ($R^2=0.4547$). However the plot reveals a strong correlation between %Emb and F0 changes ($R^2=0.8000$).

In terms of response times, the prosodic pattern indicating matrix scope was accompanied by longer response times than the prosodic pattern for embedded scope.

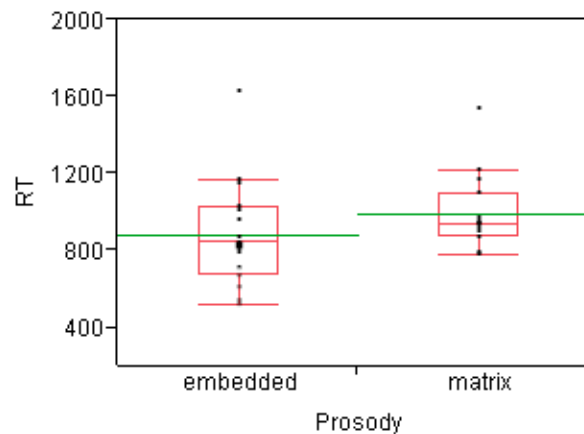


Figure 4.22. Response time (ms) by prosodic pattern in SKK

While the mean response time for prosody indicating matrix scope was longer than that for prosody indicating embedded scope, a t-test showed that the response times between the prosodic patterns marking distinct wh-scope were not significantly different ($t(1,30)=1.2739$, $p=.2125$). While this significant prosodic effect on response times is comparable to that in TJ or FJ, quite a

different tendency was revealed in the results of response times separated by prosodic pattern and responses.

Table 4.9. Mean response times (ms) by response and prosodic pattern in SKK

Prosody \ Response	embedded	matrix
	embedded	matrix
embedded	874	1644
matrix	1745	980

Similar to TJ and FJ, the combination of embedded scope prosody and embedded responses yielded the shortest response time among the conditions. However, there was no sign of longer response times for the matrix scope readings. Instead, a strong tendency was found for the correct combinations of prosody and response to yield shorter response times than their incorrect counterparts. This implies that for speakers of SKK, cases where there is a mismatch between prosody and perceived wh-scope are comprehended with greater effort or discomfort, compared to cases where the prosody is in line with scope expectations. Similar results were observed in the investigation into the role of prosodic scope marking in violating whether-island effects; these results are presented in the following section.

4.3.3.2 Effect of wh-intonation in violation of wh-island effects

In this section, I focus on the effect of prosodic scope marking on the acceptance of matrix scope readings that violate the *whether*-island effect. The results for scope assignment responses are presented before turning to the response times for the languages under investigation. Mean percentages of correct responses for matrix scope readings appear in Table 4.10, where

“correct scope” indicates the matrix wh-scope marked by the prosody of the stimulus. Results for embedded readings are also given for comparison.

Table 4.10. Mean percentage of correct scope assignment

	Intended scope	
	embedded	matrix
TJ	96.3	62.2
FJ	95.2	80.9
SKK	98.6	98.2

In comparing the accuracies among the languages, overall, SKK speakers yielded the highest, FJ speakers the next highest, and TJ speakers the lowest rate of accuracy for the matrix scope assignment based on prosodic cues. On the other hand, as predicted, the overall accuracy for embedded scope questions was nearly perfect across languages.

Even in TJ, matrix scope was successfully assigned at a rate greater than chance. Recall that no discourse context that favors the matrix scope interpretation was provided. Given the lack of context, the TJ data indicate that it is highly probable that participants were biased toward the embedded scope interpretation. It appears that the prosodic cues indicating matrix wh-scope do not completely override the bias toward embedded scope interpretations in TJ, thereby suggesting that prosodic scope marking alone cannot ameliorate *whether*-island effects. Still, the TJ result of over 62% correct matrix scope interpretations supports the claim that the scope of embedded wh-phrases is not delimited by a *whether*-island; or rather that if there is a *whether*-island effect in TJ, it can be overridden by prosody.

In FJ, parallel with TJ, the rate of accuracy for embedded scope questions was higher than that for matrix scope questions. However, the

difference between the two types of questions was noticeably smaller than that in TJ. The slightly lower rate of accuracy for the embedded reading in FJ is due to the single stimulus that contained conflicting cues. This stimulus was assigned the correct embedded interpretation 70.8% of the time, which is notably low given that the embedded interpretation is the default reading for the construction at issue. Thus, subsequent analyses were run on the data excluding this stimulus. Discarding this stimulus, the mean rate of accuracy for embedded scope in FJ reached 96.8%. It should be noted that though discarded, this stimulus shows us something important: even when the high plateau pattern marking embedded scope was provided, FJ speakers also considered the degree of F0 compression of matrix verbs. Given the great confusion in comprehension yielded by the stimulus, it seems that the change-in-progress in FJ, the lack of the obligatory high plateau pattern mentioned in Chapter 2, is not confined to production but plays a role in comprehension in this language as well.

In SKK, the acceptability rate for matrix scope readings was as high as that for embedded scope readings. This result suggests that, in this language, prosodic scope marking alone can sufficiently cue the scope of wh-phrases without requiring other cues such as contextual plausibility.

As regards response times, the results for the cases of correct responses are repeated below.

Table 4.11. Mean response times (ms) for correct scope assignment

	Intended scope	
	embedded	matrix
TJ	1131	1856
FJ	1021	1547
SKK	874	980

As can be discerned from Table 4.11, matrix scope questions yielded longer response times than embedded questions across the languages. While different depending on the languages, the response time associated with the matrix scope readings was approximately 100-700 ms longer than that associated with the embedded scope questions. As for cross-linguistic differences, TJ, FJ and SKK exhibited progressively shorter respective response times.

This result of longer response times for matrix scope corroborates the claim that matrix scope readings involve greater processing cost than embedded scope readings, which has been reported in much psycholinguistic literature (Gibson 1998 and 2000 for relative clauses, Miyamoto and Takahashi 2002 and Aoshima et al. 2003 for wh-LD-scrambling, Arnon et al. 2005 and Phillips et al. 2005 for dependencies involving wh-movement). Yet, the difference in response times between the distinct scope interpretations is smallest in SKK, greater in FJ, and greatest in TJ, implying that SKK speakers (and FJ speakers compared to TJ speakers) comprehended matrix scope questions with relatively less effort or confusion.

Note that for both wh-scope interpretations, the shortest response times were observed in SKK. This may reflect the fact that SKK speakers are more sensitive to prosodic cues. Alternatively, it is conceivable that the acoustic cues in the stimuli of SKK were more salient. Recall that greater phonetic differences were made in SKK between the questions of distinct scope in the production test.

One might think that the crucial role played by prosody in scope disambiguation is limited to SKK. Yet, before concluding this point, it is necessary to examine the large inter-speaker differences observed in TJ and FJ.

4.3.3.3. Inter-speaker variability in Tokyo Japanese and Fukuoka Japanese

While all the participants in SKK exhibited a high level of acceptability for a matrix scope reading given the relevant prosodic scope marking, the subjects in TJ and FJ showed large between-speaker differences in matrix scope acceptance, with the percentage of matrix scope readings ranging from 0% to 100% in TJ, and 17.7% to 100% in FJ. Also, an interesting tendency was observed in the response times depending on the acceptability of the matrix scope interpretations.

Let us first consider the distribution of participants according to the percentage of matrix acceptance in TJ and FJ.

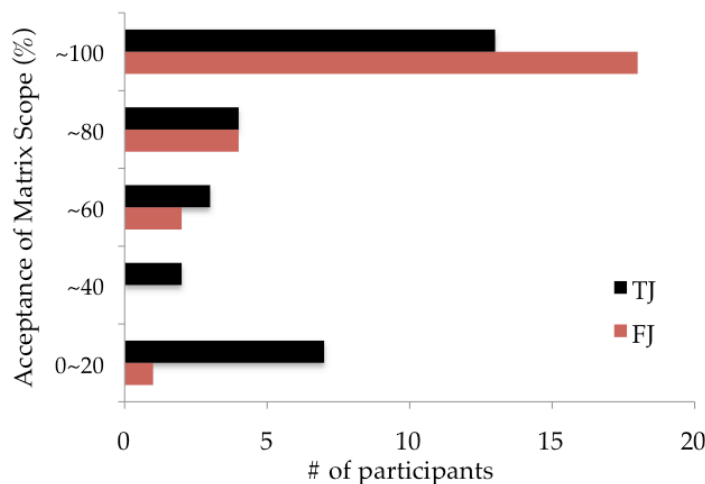


Figure 4.23. Distribution of speakers for acceptability of matrix scope in TJ and FJ

As illustrated in Figure 4.23, both TJ and FJ participants who gave the correct matrix response were dispersed over nearly the entire percentage range. The observed inter-speaker differences in accepting matrix scope suggest that the violability of the *whether*-island effect greatly varies among speakers. While both languages yielded skewed distributions toward greater acceptability of

matrix scope, FJ exhibited greater concentration in the region of higher %Mat, suggesting that more FJ speakers have a weaker *whether*-island. Given the considerably diffused distribution in TJ, it is not surprising that the acceptability judgments on *whether*-island effects have resulted in discrepancies in these languages.

Interesting tendencies were observed with respect to the correlation between the percentage of matrix acceptance and response times.

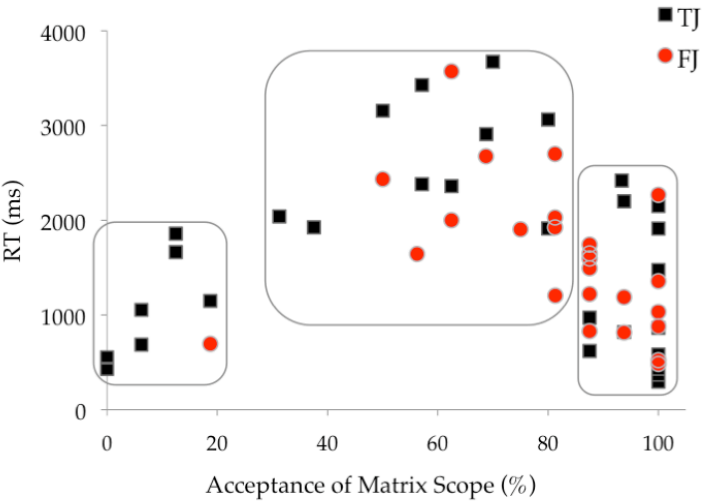


Figure 4.24. Response time by acceptability of matrix scope in TJ and FJ

Response times were positively associated with the matrix acceptability until the percentage reached approximately 70%. Yet, they tended to decrease as the acceptability further increased above 70%. As indicated by the circles in Figure 4.24, the data of response times clustered into three groups; 0-20%, 21-85% and above. The average response times among the groups were compared as shown in Table 4.12.

Table 4.12. Mean response times (ms) by percentage of correct matrix scope reading

Matrix Acceptability (%)	TJ	FJ
0-20	1056	698
21-85	2685	2152
86-100	1223	1116

Notice that the groups on either extreme, which hardly accepted (below 20%) or strongly accepted (above 85 %) matrix scope, responded relatively quickly to the questions of matrix scope. It seems that speakers who have strong island effects interpret wh-scope quickly as embedded regardless of prosodic cues. Speakers who accepted matrix scope for 85% or above, thereby having markedly weak island effects, also seem to respond quickly using the prosodic cues marking matrix scope. On the other hand, in both in TJ and FJ, the middle group exhibited a substantially longer response time than the other groups, implying that the subjects in this group were confused or not sure of their scope assignment. It may be the case that speakers who have somewhat weak island effects yield longer response times due to the dispreference toward matrix scope and conflicting prosodic cues. Or, they simply have more semantic alternatives to consider.

Still, it is necessary to examine the effect of different patterns of the prosodic scope marking, F0 compression or high plateau. Recall that only F0 compression is observed for scope marking in TJ, whereas both F0 compression and the high plateau pattern appear in FJ and SKK. It is probable that the appreciable differences observed in matrix scope acceptance and response times among the languages were incurred by the distinct implementation of wh-intonation. This possibility is discussed in the following section.

4.3.3.4 Effect of distinct prosodic pattern in Fukuoka Japanese and South Kyeongsang Korean

In order to investigate the role of different phonetic realizations of the prosodic scope marking, percentages of embedded scope responses (%Emb) and response times (RT) depending on the wh-intonation pattern were calculated separately by the intended wh-scope. Figure 4.25 and 4.26 graphically represent %Emb and RT by prosodic pattern, respectively in FJ.

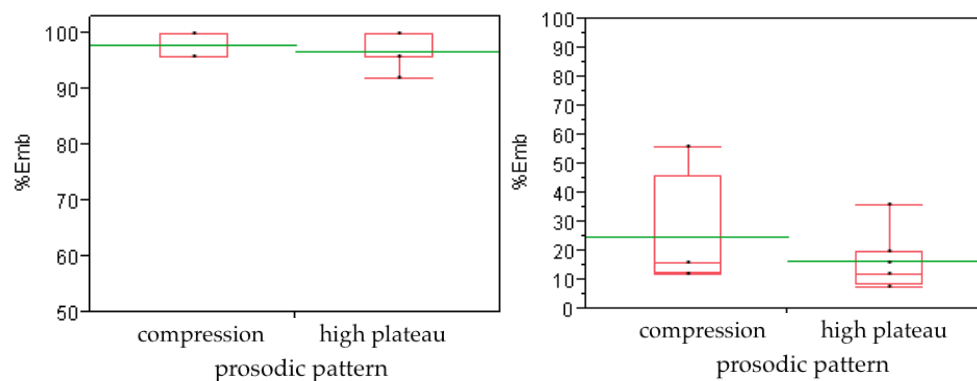


Figure 4.25. Percentage of embedded reading by prosodic pattern for embedded (left) and matrix (right) questions in FJ

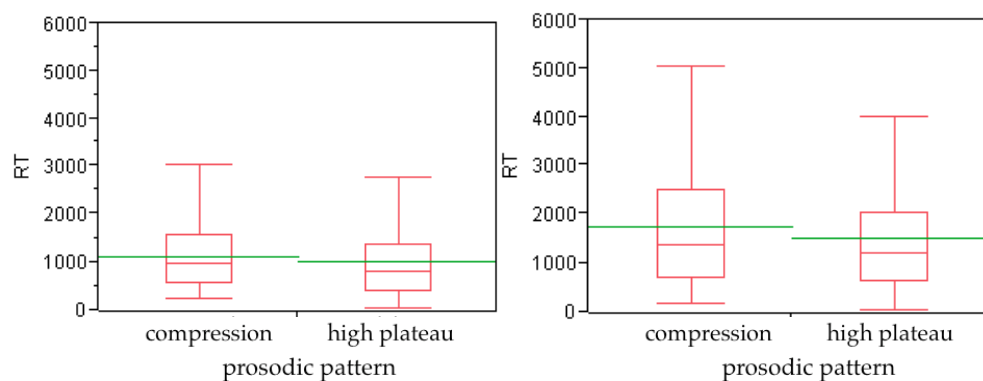


Figure 4.26. Response time by prosodic pattern for embedded (left) and matrix (right) questions in FJ

For embedded scope, F0 compression exhibited slightly greater %Emb than the high plateau did. On the other hand, when the prosodic pattern indicated

matrix scope, F0 compression yielded greater %Emb, *i.e.* lower acceptance of matrix scope, than the high plateau. However, t-tests indicated that the difference of %Emb between the prosodic patterns was not significant regardless of the intended wh-scope ($t(1,13)=-0.4898$, $p=.6324$ for embedded scope, $t(1,14)=-1/1083$, $p=.2864$ for matrix scope).

As for response times, the high plateau pattern yielded shorter response times than the F0 compression pattern for both embedded and matrix scope questions. However, t-tests showed that the effect of prosodic pattern was not statistically significant regardless of the intended wh-scope ($t(1,360)=0.7579$, $p=.4490$ for embedded scope, $t(1,323)=22.80$, $p=2.3551$ for matrix scope).

Turning to SKK, consider %Emb and RT depending on prosodic pattern, presented in Figure 4.27 and 4.28, respectively.

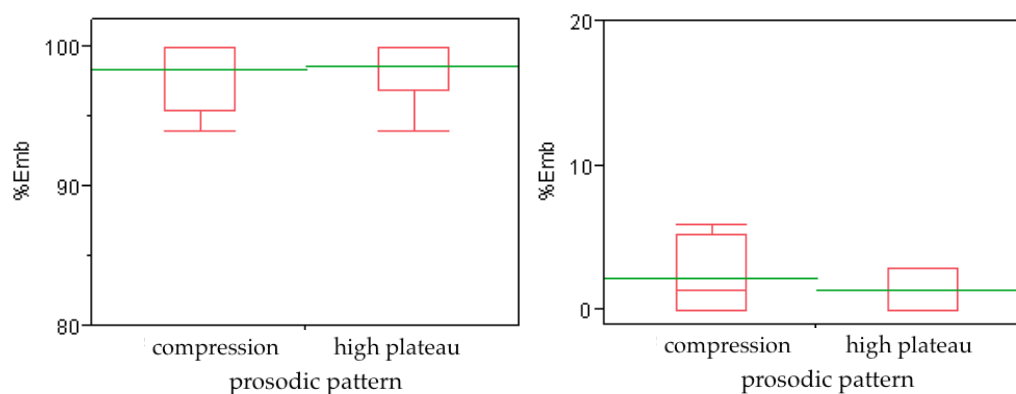


Figure 4.27. Percentage of embedded reading by prosodic pattern for embedded (left) and matrix (right) questions in SKK

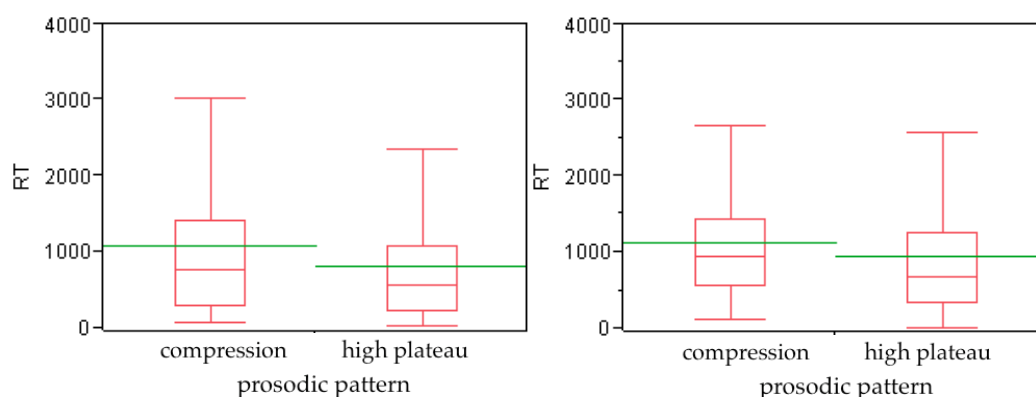


Figure 4.28. Response time by prosodic pattern for embedded (left) and matrix (right) questions in SKK

Regardless of wh-scope, the high plateau pattern of prosodic scope marking exhibited slightly greater correct responses. However, the difference of %Emb between the prosodic patterns was not statistically significant for either embedded scope ($t(1,14)=0.1919$, $p=.8505$) or matrix scope ($t(1,14)=0.6757$, $p=.5103$) questions.

With respect to response times, the high plateau pattern yielded shorter response times than F0 compression for both embedded and matrix scope questions. The results of t-tests revealed that the observed differences in response times between the prosodic pattern were significant ($t(1,503)=2.6220$, $p=.0090^*$ for embedded scope, $t(1,501)=2.1387$, $p=.0329^*$ for matrix scope).

As the F0 compression pattern of prosodic scope marking appears to incur longer response times, a question arises as to whether the response times for F0 compression in FJ and SKK are comparable to those in TJ. In comparing the results among the languages, distinct tendencies in the differences between wh-scopes were observed. Consider the average response times for correct interpretation of wh-scope depending on prosodic pattern, illustrated in Figure 4.29.

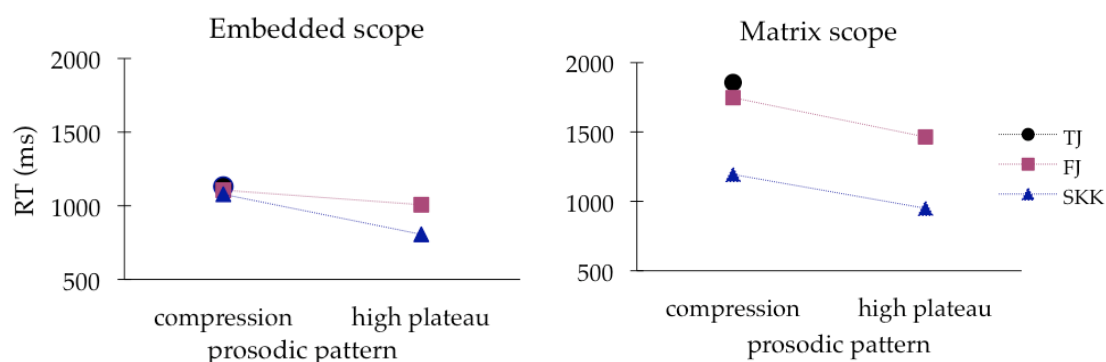


Figure 4.29. Mean response times of correct responses for embedded scope (left) and matrix scope (right) questions by prosodic pattern

For embedded scope questions, the response times of the languages were surprisingly similar when the phonetic implementation of the prosodic scope marking was F0 compression. Recall that the average response times for both prosodic types in FJ (1021 ms) and SKK (874 ms) were much shorter, compared to that in TJ (1131 ms). Thus, the shorter response times when averaged across prosodic types in FJ and SKK for embedded scope questions can be accounted for by the high plateau pattern.

As for the matrix questions, the response time for the correct assignment of matrix scope yielded by the F0 compression pattern in FJ appeared to be quite similar to that in TJ. However, both prosodic patterns in SKK exhibited appreciably shorter response times compared to those in TJ and FJ. This difference can be attributed to cross-linguistic syntactic differences between Japanese and Korean, namely that the Korean Comp corresponding to *whether* creates a weaker island or no island at all (H.S. Lee 1982, C.M. Suh 1987). Another possibility is that the status of the high plateau influences the acceptability of matrix scope. Recall that FJ lacks the obligatory high plateau pattern in production, and further, the pattern was not considered an

exclusive scope marker of wh-phrases in comprehension.

4.4 General discussion

In this chapter, I investigated scopally ambiguous wh-interrogatives involving *whether*-island effects, particularly focusing on the acceptability of matrix scope interpretation. In exploring the role of context plausibility and prosodic scope marking in the resolution of wh-scope ambiguity, I conducted a production test and a comprehension test in TJ, FJ and SKK. In this section, I begin by summarizing the experimental results in §4.4.1. In §4.4.2, I discuss the role of context plausibility, and then I turn to the effect of prosodic scope marking in §4.4.3. Finally, I address the large between-speaker difference in the acceptability of matrix scope in §4.4.4.

4.4.1 Summary

The production test was designed to test if contexts favoring each scope interpretation can influence speakers' scope assignments, with special attention given to the role of a plausible context for matrix scope in violation of the *whether*-island effect. The results showed that most speakers interpreted wh-scope as intended by the context in violation of the island effect, suggesting that context plausibility plays a crucial role in wh-scope disambiguation. Also, the distinct scope interpretation was reflected in the phonetic implementation, exhibiting a distinct wh-intonation pattern for each scope. Specifically, however, some speakers of TJ did not produce appreciable F0 differences on matrix verbs in the two types of wh-scope questions. In FJ, some differences concerning the prosodic scope marking were observed; tones of wh-phrases varied freely, lacking the obligatory high plateau pattern. Thus,

it was difficult to predict which type, F0 compression or high plateau, would occur. SKK exhibited the most salient prosodic differences between questions of distinct *wh*-scope. While the high plateau pattern was pervasive regardless of the *wh*-phrase and *wh*-scope, some speakers produced the F0 compression pattern following ‘who’ produced with a falling tone. (Recall that the *wh*-phrase ‘who’ in SKK bears alternating lexical tones.) In that case, F0 peaks of matrix verbs in matrix scope questions were considerably higher than those in embedded scope questions.

As regards the comprehension test, overall, distinct prosodic patterns yielded the intended scope interpretations across the languages. The results revealed that prosodic scope marking plays an important role in determining *wh*-scope.

In accepting the matrix scope interpretation in violation of the *whether*-island effect, however, large inter-speaker variability was observed in TJ and FJ. TJ exhibited the lowest acceptability and the longest response times among the languages. FJ showed rather greater acceptability of matrix scope and shorter response times than TJ. In FJ, it was also observed that speakers considered the F0 excursion size of a matrix verb even when a discrete falling tone on an embedded Comp clearly signaled embedded scope. This implies that changes-in-progress in FJ are occurring not only in the production but also in the comprehension of *wh*-questions. In SKK, the acceptability of matrix scope appeared to be as great as that of embedded scope, exhibiting extremely weak *whether*-island effects. Also, the shortest response times were observed in SKK among all of the languages in question regardless of *wh*-scope.

Different prosodic patterns of prosodic scope marking—the high plateau or F0 compression—in FJ and SKK did not play a significant role in

the acceptability of matrix scope. However, the high plateau yielded significantly shorter response times for scope disambiguation.

4.4.2 Emergence of contextual plausibility

In comparing the discrepancy in acceptability judgments for matrix scope in the literature and the results of the production test in the present study, the role of context is evident as the matrix scope reading is available given the discourse context plausible to the interpretation. It clearly shows that pragmatics influences scope disambiguation across languages. This result corroborates the finding reported by Hirose and Kitagawa (2007) that speakers of TJ accept matrix scope readings if contexts favoring the scope are provided. Further, the results of the current experiment support the argument that the unacceptability judgment, in part, stems from the unusual context that is necessary for the accommodation of matrix scope interpretations.

Interestingly, interrogatives are recognized to be sensitive to presupposition and discourse structure. It has been widely accepted that the non-questioned part of an interrogative clause is normally discourse-presupposed (Lambrecht 1994, Lahiri 2002, among others). This indicates that for matrix interpretation, all other materials in the phrase, particularly matrix verbs should be presupposed. However, the contexts where a matrix verb is presupposed are not easy to come up with compared to the contexts where presupposition of the matrix verb is not required.

Crain and Steedman (1985) and Altmann and Steedman (1988) exploit the notion that a null context is not necessarily a neutral context as a null context might favor one interpretation over another. This was originally argued for the garden-path effect, where the interpretation which carries

fewer unsupported implicatures is favored. Based on this observation, the principle of parsimony (Crain and Steedman 1985) and the principle of referential support (Altmann and Steedman 1988) were proposed.

A similar observation is made by Kuno (1987). He argues that acceptability judgment is not made purely according to syntactic structure, based on the asymmetry in the examples below.

- (4.18) a. * Yesterday, I met the actress who I had bought Mary's portrait of.
b. Yesterday, I met the model who I just bought Avedon's portrait of.

Kuno (1987) correctly points out that (4.18b) is considerably better than (4.18a) if the hearer knows that Avedon is a famous photographer. (4.18a) requires a special context such as the following.

There is a portrait by Mary of the man under discussion, as well as of many other persons/objects...The sentence also presupposes that the preceding discourse has been about the fact that the speaker is accustomed to buying Mary's portraits (p. 18).

Note that the unacceptability of (4.18a) cannot be attributed to a syntactic constraint: (4.18a) is judged unacceptable because speakers are not able to come up with the unusual context as given above.

It has been convincingly argued that resolution of syntactic ambiguity integrates lexical, syntactic, semantic, discourse, and situational variables in real time (Spivy and Tanenhaus 1998). Multiple cues simultaneously contribute to the understanding of a sentence by combining information

sources from phonology, semantics, syntax, pragmatics, and so on. Instrumental work that takes into consideration multiple cues is particularly useful when there is a lack of agreement on judgment. Thus, it is not surprising that disambiguation of the scope ambiguity in the structure of interest involves the integration of multiple cues, in particular, pragmatic contexts.

4.4.3 Role of prosody

In consideration of a prosodic bias against matrix scope, Kitagawa (2005a) argues that the intonation pattern for the matrix scope reading is disfavored as it violates the general principle ‘avoid monotony’ (Selkirk 1984, Kubozono 1993). Further, according to Selkirk (2000), a prosodic boundary tends to align with a syntactic boundary. Note that there is a major syntactic boundary after embedded Comps *i.e.* the boundary between matrix and embedded clauses. Thus, it is predicted that in a null context, a prosodic boundary tends to be inserted after a Comp, resulting in the prosodic pattern favoring embedded scope readings. The comprehension test of the present study provides answers to the question of whether the dispreference toward matrix scope can be ameliorated by the intonation pattern lacking a prosodic boundary after an embedded Comp.

Across languages, the resolution of *wh*-scope ambiguity appears to be significantly driven by prosodic cues, showing the role of prosodic scope marking in overriding the *whether*-island effect. In fact, the crucial role of prosody in the disambiguation of syntactic ambiguities has been extensively documented (Lehiste 1973, Ladd 1980, Price et al. 1991, Wightman et al. 1992, Nagel et al. 1996, Schafer et al. 2000, Kraljic and Brennan 2005, among others).

Particularly for scope ambiguities, Baltazani (2002) provides experimental results of a construction involving the interaction between negation and a quantifier in Greek. An example of the test material in a verb-object order is given below. According to Baltazani (2002), the sentence in (4.19) is potentially ambiguous but each of the two interpretations is realized with a distinct prosodic pattern.

- (4.19) den élisán pollá provlímata
 not solved-3pl many problems
 ‘They did not solve many problems’
 a. ‘The problems they solved are not many.’ [NOT > MANY]
 b. ‘There are many problems they didn’t solve.’ [MANY > NOT]

In a production test with a disambiguating context for each reading, Baltazani found that speakers indeed consistently exhibited distinct prosody; for the case in which negation takes scope over the quantifier (4.19a), prosodic prominence aligns with negation, and all the items following are de-accented, forming a low plateau. On the other hand, when the quantifier takes scope over negation, a prosodic boundary appears between the verb and the quantifier *many*, indicating that the negative particle and the quantifier occur in a separate prosodic phrase. In addition, the quantifier—not the negative particle—is most prominent, exhibiting the nuclear pitch accent L+H*. The results of her comprehension test also show that the distinct prosodic pattern plays an important role in the resolution of the scope ambiguity.

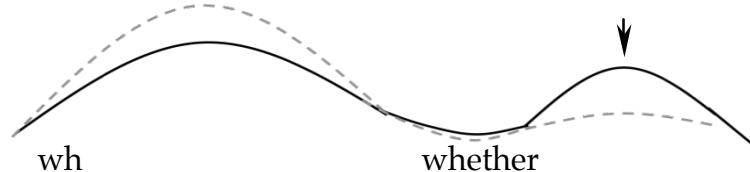
Returning to the results of the comprehension test in the present study, speakers of the languages at issue exhibit different behaviors regarding the

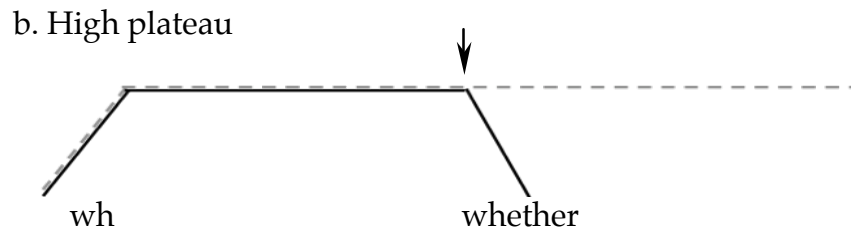
acceptability of matrix scope. In TJ and FJ, the strength of the island effect and influence of the prosodic pattern vary considerably depending on the speaker; for the speakers who exhibit rather weak *whether*-island effects, the prosodic scope marking ameliorates the effects but does not completely override them. On the other hand, in SKK, matrix readings in violation of the *whether*-island effect are readily available given the prosodic cues appropriate for that reading. In this variety of Korean, prosody appears to have priority over any pragmatic/contextual bias against matrix scope. To what should the observed difference between Japanese and Korean be attributed?

One possibility is that the difference lies in part in the distinct surface patterns of the prosodic scope marking. This possibility receives experimental support from the results of response times in the present study; in comparing response times yielded by the two prosodic patterns of *wh*-intonation, the high plateau pattern appears to provide more certainty than the F0 compression pattern. It seems that, for the high plateau pattern, speakers can disambiguate and be confident about the *wh*-scope as soon as they encounter a discrete prosodic marker of an embedded Comp. Consider the schematic contours of distinct *wh*-scope illustrated in (4.20). The solid and dotted lines represent embedded and matrix scope, respectively. Arrows indicate the moment that the contours of distinct *wh*-scope clearly diverge.

(4.20) Schematic pitch contours of prosodic scope marking

a. F0 compression





In either case, the two scope readings demonstrate quite comparable pitch contours before the embedded Comp. While F0 compression exhibits a higher F0 peak on *wh*-phrases in matrix questions than that in embedded questions, it is not a reliable cue for *wh*-scope assignment as *wh*-phrases in both scope questions are substantially raised compared to their non-*wh* counterparts. Thus, for the F0 compression pattern, it seems that speakers wait until they hear the F0 of matrix verbs and disambiguate *wh*-scope based on the F0 peaks on matrix verbs or the F0 changes between *wh*-phrases and matrix verbs. On the other hand, for the high plateau pattern, a discrete acoustic difference between the two readings is observed in the Comp before the speaker encounters matrix verbs. The discrete fall on the embedded Comp implies that speakers disambiguate the *wh*-scope as soon as they encounter the presence or absence of the discrete falling tone of a Comp. Thus, it is not surprising that speakers respond more quickly for the high plateau pattern than for the F0 compression pattern.

Also, the high plateau yields slightly higher percentages of correct responses than F0 compression, suggesting that the high plateau is a more reliable marker of *wh*-scope than F0 compression. Presumably, this is due to the fact that F0 compression can be interpreted as conveying discourse-givenness. Recall that the high plateau pattern exclusively marks *wh*-scope, whereas F0 compression signals not only *wh*-scope but also information

status, specifically givenness. However, the slight degree of the effect makes it difficult to consider prosodic patterns the primary factor to account for the difference in acceptability of matrix scope between Japanese and SKK.

Alternatively, the distinct behavior between Japanese and SKK regarding the acceptability of matrix scope can be attributed to other cross-linguistics differences. While Japanese and Korean share a number of structural properties, the Korean Comp *-ci*, corresponding to *whether*, may establish a weaker island which can be completely overridden by the prosodic marking of matrix scope. In order to test this possibility, however, it would be necessary to investigate other varieties of Korean, on the assumption that the characteristics of *-ci* with respect to the island effect are comparable among different varieties of Korean. One instance of support for such a cross-linguistic difference comes from H.J. Hwang's (2007) study which examined the role of prosody in wh-scope disambiguation in Seoul Korean and SKK. While Seoul Korean, known as an intonational language without lexical pitch accent, is prosodically different from SKK, it is worthwhile to consider this work as it is the only study that provides the relevant data.

H.J. Hwang (2007) tested six auditory stimuli for each scope reading in SKK and Seoul Korean. Following Jun and Oh (1996), she assumed that the two scope interpretations exhibit different boundary tones: H% for the embedded reading *vs.* HL% for the matrix reading in Seoul Korean. For SKK, she argued that embedded scope readings exhibit H% or HL%, whereas matrix readings yield L%. It should be noted that H.J. Hwang did not note the exceptional prosodic scope marking in SKK *i.e.* a high plateau, though it was evident in the pitch tracks she presented. Nevertheless, she tested the role of prosody in wh-scope interpretation using natural utterances. Six speakers of

each variety were asked to disambiguate the wh-scope. The accuracy of scope interpretation when the intended prosodic patterns were given is presented below.

(4.21) Average percentages of scope interpretation in Seoul Korean and SKK (H.J. Hwang 2007)

	Intended Prosody	
	Embedded scope	Matrix scope
Seoul Korean	100%	94.6%
SKK	71%	100%

Both in Seoul Korean and in SKK, the matrix scope reading was accepted to a high degree given the prosodic pattern signaling matrix scope. However, the details of how the stimuli were created were left unreported. H.J. Hwang (2007) notes as the following:

The stimuli were produced with variation in the positioning of ‘wh-prosody’ and ‘yes-no prosody’—in certain questions wh-appropriate prosody was applied in CP₂ (embedded clause) and ‘yes-no prosody’ in CP₁ (matrix clause) and in other questions the opposite pattern was applied.

It is not clear whether H.J. Hwang provided contexts to disambiguate the scope at the time of creating the stimuli. Also, no detailed phonetic descriptions were given regarding the difference between the prosodic patterns of distinct wh-scope. Thus, it is difficult to discern the characteristics of ‘wh-prosody’ and ‘yes-no prosody’. Also, H.J. Hwang did not consider

other prosodic cues such as the F0 of *wh*-phrases and the degree of F0 compression. Further, for SKK, the scope-specific endings *-na*/*-no* were used. Recall that this is another scope marker independent of the prosodic cues. More importantly, the accuracy for embedded readings in SKK was markedly low (71%) though an embedded reading is the unmarked interpretation. Moreover, in the stimuli, not only the prosodic cues, but also the morphological marker *-na* was given signaling embedded scope. Yet, the surprisingly low accuracy for the embedded scope reading in SKK was left unexplained. The issues regarding methodology aside, the notably high rate of acceptability of matrix scope in Seoul Korean supports the possibility that Korean has a generally weaker *whether*-island effect than Japanese.

Nonetheless, we cannot rule out the possibility that the effect of prosody is more influential than it previously appeared to be. As with the previous studies, only natural utterances obtained in the production test were used as the stimuli for the comprehension test. Consequently, the acoustic differences of the stimuli were not equally controlled for the different languages. Recall that the prosodic differences between distinct scope readings were the most salient in SKK, particularly for the F0 compression pattern of the prosodic scope marking. On the other hand, some speakers of TJ and FJ exhibited no appreciable F0 difference in matrix verbs between distinct interpretations. It may be the case that listeners require a much larger difference in the absence of other cues, though some speakers do not produce substantial acoustic differences given a disambiguating context. Thus, it is quite probable that fine-grained acoustic characteristics in the production influence the comprehension of *wh*-scope. Further, FJ showed signs of ongoing changes for production by showing the lack of an obligatory high

plateau and the lack of accent loss in embedded verbs for embedded scope readings. The results of the comprehension test also exhibited that FJ speakers accept the F0 compression cue as well as the high plateau cue in comprehension, implying a reduced role played by the high plateau pattern as an exclusive marker of *wh*-scope. Thus, in order to confirm the role of prosodic scope marking or the cross-linguistic difference with respect to the *whether*-island effect between Korean and Japanese, more carefully controlled experiments would be necessary using synthesized stimuli involving the same acoustic difference between distinct scope readings across languages, including other varieties of Japanese and Korean. In addition, there could be other prosodic cues such as the lengthening of a Comp or the presence of a pause or a discrete boundary tone. Further research into the possibility of other prosodic cues is also required.

In the following section, the notable between-speaker difference in acceptability of matrix scope in TJ and FJ, which cannot be attributed to pragmatic or prosodic factors, is discussed.

4.4.4 Variability in acceptability of *whether*-island violations

It appears that the acceptability of matrix scope is not categorical; it varies substantially among speakers of TJ and FJ, showing that for some speakers, the violation of the *whether*-island effect is reconciled with the prosodic cues for matrix scope. It seems that the sensitivity to *whether*-island effects and to prosodic scope marking is different among speakers.

Given the inter-speaker difference in TJ and FJ, it would be more appropriate to interpret the 62% rate of acceptability of matrix scope as an average of 62% of speakers accepting matrix scope rather than each speaker

accepting an average of 62% of matrix scope readings. Though the issue was not explicitly addressed, I suspect that compatible between-speaker differences were observed in the previous research where similar tests were performed (Hirotani 2005, Hirose and Kitagawa 2007).

Though not all speakers of TJ and FJ accept matrix scope, the appreciable variability in matrix acceptability calls into question the syntactic account for wh-island effects. Note that the judgments reported in the previous literature on wh-island effects were largely made with written examples lacking pragmatic contexts or prosody, and it was concluded that the violation of the wh-island effect is ungrammatical based on the impressionistic judgments depending entirely on syntactic structure. The results of the current study suggest that the structural account for wh-island effects needs to be reassessed, reinforcing more interactive perspectives on the effects.

In addition, this considerable between-speaker difference in acceptability of matrix scope by prosodic cues implies that there may be other factors involved, triggering the bias against matrix scope interpretations. In fact, there is a line of research where island constraints are accounted for by processing difficulty (Bard et al. 1996, Schütze 1996, Cowart 1997, Gibson 1998, Kluender 1998, Miyamoto and Takahashi 2002, Warren and Gibson 2002). The longer response time for the matrix scope interpretation found in the current study supports the notion of a greater processing load for that reading.

4.5. Conclusion

In this chapter, I have presented the results of a production test and a comprehension test to investigate the role of pragmatic contexts and prosodic

scope marking in the resolution of wh-scope ambiguity, with special attention given to the widely upheld *whether*-island effect.

The results of the production test reveal that when a plausible context is provided, speakers tend to accept the matrix scope interpretation in violation of the *whether*-island effect, and the distinct scope interpretations yield phonetically different prosodic patterns. As for the comprehension test, in TJ and FJ, the violation of the island effect is improved considerably if the prosodic marking for matrix scope is given. Nevertheless, considerable interspeaker differences are observed. In SKK, on the other hand, speakers accept the matrix scope reading as readily as the embedded reading.

The *whether*-island constraint appears to be violable. The experimental results show that the *whether*-island constraint can, completely or partially, be overridden by plausible contexts and the appropriate prosodic marking of wh-scope. In light of this work, as language comprehension involves multiple cues, it appears increasingly inadequate to analyze a language solely based on one's intuitive acceptability judgments with respect to isolated written sentences. Rather, the critical role of pragmatics and prosody in these cases highlights the need for an expanded scope of analysis, one which can incorporate the interactivity observed here.

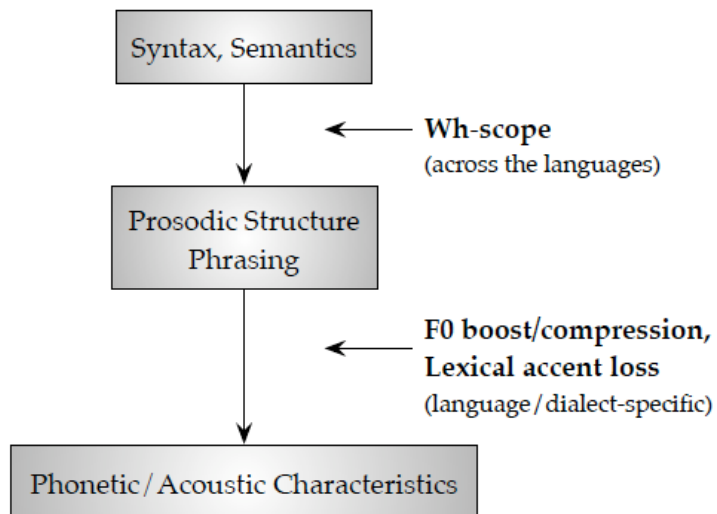
CHAPTER 5

CONCLUSIONS

5.1 Summary and implications

In this study, I have investigated the acoustic characteristics of prosodic wh-scope marking and its role in wh-scope assignment, on the assumption that prosodic scope marking in the languages under investigation can be represented as prosodic phrasing as illustrated in (5.1) below.

(5.1) Model of prosodic scope marking



First, I have argued that prosodic scope marking can be generalized as prosodic phrasing. In TJ, the prosodic phrasing is phonetically implemented as F0 compression, whereas in FJ and SKK, it is implemented either as F0 compression or as the high plateau pattern.

Second, I have shown that the variation between F0 compression and high plateau is not arbitrary: the tone of wh-phrases is the determining factor.

More specifically, F0 compression is correlated with a falling tone on the *wh*-phrase, while the high plateau correlates with a rising tone on the *wh*-phrase.

Third, I have argued that marking of FOCUS and *wh*-scope are distinct at least from the prosodic point of view. We have seen that FJ and SKK show distinct prosodic patterns for the two: the F0 compression pattern for FOCUS marking, and the high plateau pattern for *wh*-scope marking.

Fourth, I have demonstrated that the prosodic scope marking terminates with the Comp associated with a *wh*-phrase, regardless of word order. Particularly, in the context of LD-scrambling, the experimental results taking information structure into serious account reveal that the right edge of the prosodic scope marking consistently aligns with the embedded Comp across the languages as presented in (5.2).

(5.2) LD-scrambled *wh* taking embedded scope

wh [CP Sub_m [CP *t*_{wh} V_e-Comp_[+wh]] V_m-Q_[-wh]]

Finally, systematically in all three languages, it is revealed that context plausibility and the prosodic scope marking play a crucial role in the acceptability of the matrix scope reading in violation of *wh*-island contexts.

(5.3) Embedded **wh** taking matrix scope (violation of *wh*-island effect)

[CP Sub_m [CP **wh** V_e-Comp_[-wh]] V_m-Q_[+wh]]

I have argued that *wh*-island effects should not be attributed solely to the syntactic structure, and shown the need for an expanded field of analysis, one which can incorporate this observed interactivity between prosody, pragmatic context, and syntax.

Notice that the prosodic domains marked by *wh*-intonation in (5.2) and (5.3) correspond to no syntactic constituent. A remaining question is then how to account for the correlation of *wh*-scope and prosody in terms of the syntax, or for that matter, even the syntax-phonology interface. In order to account particularly for the non-constituency of the prosodic scope marking, I offer two possible syntactic accounts, one in terms of the operation Agree, and the other in terms of cyclic spell-out.

This chapter is structured as follows. In §5.2, I provide two syntactic accounts of the prosodic scope marking involving the operation Agree (§5.2.1) and cyclic spell-out (§5.2.2). In §5.3, I consider directions for future research.

5.2 Syntactic accounts

5.2.1 Syntactic model based on Agree

In order to account for the prosodic scope marking in TJ, a model based on Agree was proposed by Kitagawa and Deguchi (2002) and Kitagawa (2005a, b). This model is intriguing and correctly predicts most instances of *wh*-scope marking in TJ. However recall that it includes several invalid or problematic assumptions. As discussed in §3.1.2, the first of these is that *wh*-intonation is ‘focus’ intonation, and that a *wh*-phrase which triggers *wh*-intonation is prosodically prominent. To implement this proposal, Kitagawa (2005b) assumes the feature set introduced in §3.1.2. It is repeated in (5.4) below.

- (5.4) a. **WH-P** – Focus *Wh*-phrase
 b. **Wh-P** – Non-focus *Wh*-phrase
 c. **FP** – *Non-wh focus* phrase (both presentational and contrastive)

- d. **Wh** – Reference to Wh-in general as in “Wh-questions, Wh-phrase, Wh-in-situ”

Notice that the assumptions incorporated into the feature set above cannot be extended to FJ or SKK, because wh-scope is distinct from ‘focus’, and wh-phrases are not prosodically prominent in these languages. Further, it is not clear what kind of ‘focus’ is intended in the classification for wh-phrases. Thus, in modifying the Agree-based model, I propose the simplified feature set in (5.5).

- (5.5) a. [wh] – Is inherently assigned on wh-phrases
b. [FOCUS] – Can be assigned on both wh and non-wh items by discourse/information structure.

In addition, following Kitagawa and Deguchi (2002), I assume the following.

- (5.6) a. An uninterpretable [wh] feature is assigned on Comp, and interpretable [wh] feature on a wh-element.
b. An uninterpretable [wh] feature on Comp is deleted through Agree.
c. The Agreement is interpreted as a semantic scope of a wh-element at LF, and wh-intonation is assigned at PF.

A further problematic aspect of Kitagawa and Deguchi’s (2002) account is that they do not erase checked features at PF, without any discussion as to why and how these features can remain accessible at the interface. I assume that the uninterpretable [wh] feature is deleted at PF as well, following Chomsky’s

(2001) position that every uninterpretable feature is deleted before entering the interface level.

While the prosodic scope marking is straightforwardly accounted for in matrix questions, and in embedded scope questions with in-situ wh, embedded scope questions involving wh-LD-scrambling require another assumption for the observed prosodic pattern at PF. This is that a [wh] feature pair standing in an Agreement relation is ‘linearly scanned’ (Kitagawa and Deguchi 2002); that is, the checking relationship references linear order, not syntactic structure. Recall that the best empirical generalization from the data is that wh-intonation is assigned from a wh-phrase to the Comp linearly.

(5.7) LD-scrambled wh taking embedded scope

- embedded wh-scope
- a. LF: [_{CP} ~~nani[wh]~~-o Naoya-wa [_{CP} Mary-ga nani[wh]-o nonda-ka[~~wh~~]]
imademo-oboeteru]
- b. PF: [_{CP} nani[wh]-o Naoya-wa [_{CP} Mary-ga nonda-ka[wh]] imademo
oboeteru]]

As shown in (5.7), the upper copy, which is outside the domain of Agree, is deleted at LF. On the other hand, the original copy establishes Agreement with the embedded Comp and a wh-embedded scope interpretation is obtained. At PF, linear-scanning applies here and the wh-intonation is assigned on the material between the feature pair. The ‘linear scanning’ apparatus is required to assign wh-intonation on the atypical domain, a domain which does not correspond to any single syntactic constituent. We see here that the domain of the prosodic wh-scope marking in this structure is difficult to drive by a purely syntactic mechanism such as Agree. This is

because the material of the embedded clause is embedded under the matrix subject; the linear nature of prosody appears to override syntactic constituency.

5.2.2 Syntactic model based on cyclic spell-out

Interestingly, a very similar pattern of non-constituency in the domain of wh-dependencies was reported in Kikuyu, a tonal Bantu language spoken in Kenya. Clements (1984) provides an account for a downstep deletion observed in post-wh material in Kikuyu. Inspired by this work, H.K. Hwang and Whitman (2009)¹ develop an account for the prosodic wh-scope marking under the assumption of cyclic spell-out (Uriagereka 1999, Chomsky 2000, 2001). Let us first consider the phenomenon of downstep deletion in Kikuyu and Clements (1984)'s analysis to account for the phenomenon before turning to prosodic wh-scope marking in the languages at issue. Relevant examples are presented in (5.8), which show that post-verbal downstep is deleted when ex-situ wh-phrases precede the verb phrase. The downstep morpheme is represented by '↓'.

(5.8) Downstep deletion in Kikuyu

a. Kariukì	á-↓tém-íré	mo-tě↓	'Kariuki cut a tree.'
	SP-cut-T	CP-tree	
b. Nó.o	o-tém-íré	mo-te?	'Who cut a tree?'
FP-who	PP-cut-T	CP-tree	

(SP: subject prefix, CP: nominal class prefix, FP: focus particle, PP: pronominal prefix)

¹ I am grateful to John Whitman for pointing out the similarity between Kikuyu and the languages under investigation in this regard, and for helping develop the account based on cyclic spell-out proposed here.

In the Kikuyu morphology, the downstep suffix 'ʼ' appears in the right of the first complement following a verb as in (5.8a). In comparing the post-verbal complement in (5.8a) and in (5.8b), it is clearly observed that the downstep suffix is deleted in (5.8b) where a *wh*-phrase is optionally extracted to the clause initial position. Thus, the dependency of a *wh*-phrase with its gap in Kikuyu is marked by a deletion of the downstep morpheme. Notice that *wh*-dependencies have prosodic consequences both in Kikuyu and the languages under investigation in the present study: downstep deletion in Kikuyu *vs.* F0 compression/tone deletion in TJ, FJ and SKK.

Strikingly, a further crucial resemblance is observed in the example below: the domain of a *wh*-dependency does not simply correspond to its surface *c*-command domain.

- (5.9) a. NÓ.oi [Káma.ú a-ér-^ʼíré Kaanáké [áte _{ti} o-tem-íré mo-tě]]?
 FP-who SP-T-tell-T that PP-cut-T CP-tree
 ‘Who_i did Kamau tell Kanake that _{ti} cut a tree?’
- b. NÓ.oi [Káma.ú a-ér-^ʼíré _{ti} [áte Kariokĩ á-^ʼtém-íré mo-tě’]]
 FP-who SP-T-tell-T that SP-cut-T CP-tree
 ‘Who_i did Kamau tell _{ti} that Kariuki cut a tree?’

In comparing the complements of the most deeply embedded clauses, we observe that the downstep suffix is *not* deleted if the gap is located outside the clause (5.9b). The downstep deletion pattern in this context thus resembles the prosodic *wh*-scope marking in embedded scope questions with LD-scrambling in the languages at issue, in that the associated elements establish long distance dependencies: *wh*-gap in Kikuyu, and *wh*-Comp_[+wh] in the languages at issue. More importantly, notice that the domains of their

prosodic consequences correspond to no syntactic constituent on their surface.

Moreover, the lack of the downstep deletion in (5.9b) implies that the marking of the *wh*-dependency in Kikuyu is cyclic. It should be noted that the lack of the dependency marking in the most deeply embedded clause can be straightforwardly accounted for by the Phrase Impenetrability Condition (Chomsky 1999, 2001). The condition prevents operations at the next phase from accessing the complement of a phase that is already sent to PF. The simplified derivation for (5.9b) is provided in (5.10). Let us assume that *wh*-dependencies are marked cyclically in the *c*-command domain of a *wh*-phrase on each cycle of a derivation. Cyclic domains are *v*P and CP (Chomsky 2001a, b).

As in (5.10a), the most deeply embedded CP is first spelled out, thereby retaining the downstep suffix intact.

- (5.10) a. [_{CP} áte Kariokĩ á-^ltém-íré mo-tě^l]
 b. NÓ.oi [Káma.ú a-ér-^líré ti [_{CP} áte Kariokĩ á-^ltém-íré mo-tě^l]]

Next, the matrix CP is merged, and the *wh*-phrase is preposed. For marking the dependency between the *wh*-phrase and its gap, downstep deletion takes place in the *c*-command domain of the *wh*-phrase. However, downstep deletion does not apply to the embedded CP because it has already been spelled out.

Let us turn now to the embedded scope questions with LD-scrambling in TJ, FJ and SKK. Following Saito (1985, 1989), let us assume that LD-scrambling in Japanese and Korean is a cyclic adjunction process. The derivation in the target languages is given in (5.11) below.

(5.11) LD-scrambled wh taking embedded scope

- a. $[_{vP} \text{Sub}_e \text{wh}_i [_{vP} t_1 \text{Ve-Comp}_{[+wh]}]]$
- b. $[_{CP} \text{wh}_1 [_{TP} \text{Sub}_e [_{vP} t_1 \text{Ve-Comp}_{[+wh]}]]]$
- c. $[_{\text{wh}_1} [_{vP} [_{CP} t_1 [_{TP} \text{Sub}_e [_{vP} t_1 \text{Ve-Comp}_{[+wh]}]]]]V_m]]$
- d. $[_{CP} [_{TP} \text{wh}_1 [_{TP} \text{Sub}_m [_{vP} [_{CP} t_1 [_{TP} \text{Sub}_e [_{vP} t_1 \text{Ve-Comp}_{[+wh]}]]]]V_m]]]-Q_{[-wh]}]$

First, in the embedded *vP* cycle (5.11a), the complement *vP* is spelled out, and prosodic marking applies. In (5.11b), the embedded CP merges, and the *wh*-phrase scrambles to the initial position of the CP. Then, the complement TP is spelled out, and undergoes prosodic marking. The *wh*-phrase further moves and adjoin to the matrix *vP* (5.11c). Then the matrix *vP* is spelled out. Since there is no *wh*-phrase adjoined to the spelled out phrase, prosodic marking does not apply, thereby leaving the matrix verb unaffected by the *wh*-scope marking. In the matrix CP cycle (5.11d), the *wh*-phrase lands in the initial position of the matrix CP, and the complement TP is spelled out. However, due to the Phrase Impenetrability Condition, the prosodic pattern of the matrix verb remains intact. This cyclic derivation shows that the observed non-constituency can be accounted for under this account. While further refinements are necessary for this account, it has advantages of obviating the need for syntactic features at a surface level of representation or the ‘linear scanning’ proposed by Kitagawa (2005a).

5.3 Directions for further study

Methodologically, this study shows that an experimental approach is essential investigating phenomena where consensus has not been reached on the data in the literature. However, there remains much to be investigated

about prosodic scope marking, requiring more strictly controlled experimental work.

First, not only the pitch, but also other acoustic cues may come into play. For instance, the duration of a Comp, presence or absence of the pause following a Comp, or the duration of an entire wh-phrase or verb phrases may influence the assignment of wh-scope.

Also, it remains to be seen to what extent listeners of the three languages allow for the violation of wh-island effects given identical acoustic differences between distinct scope readings by utilizing synthesized stimuli. Recall that the phonetic details of the stimuli in the comprehension test of the present study were distinct among the stimuli and languages. In order to strictly compare the role of the prosodic scope marking in disambiguating wh-scope among the languages, controlling the fine-grained acoustic characteristics of each stimulus is required.

In addition to pursuing issues in the experimentation and acoustic characteristics of the prosodic scope marking, it is also necessary to further investigate the interface issues among various components of linguistics. The present study has revealed that valuable insights can be gained into the interface between prosody and syntactic/information structure. Yet, there are numerous issues to be examined, which were not the focus of the current study.

The approach pursued in the present study lends itself naturally to application to other 'syntactic' constraints involving wh-dependencies in Japanese and Korean which merit further examination. In investigating wh-interrogatives with great complexities, contextual plausibility or prosodic effect has largely been neglected in the syntactic literature. Particularly, the

exceptional pitch contour in FJ and SKK remains unexplored as only the standard varieties, focus on the.

Another direction for further research is to investigate the interaction between FOCUS and wh-interrogatives. The experiment in Chapter 3 of the current study revealed that the intonation pattern yielded by FOCUS and the prosodic wh-scope marking are distinct. The results obtained in the present research will be fed into a study on the interaction involving constructions in which their domains are partially or completely overlap. Intuitively, in SKK, if a FOCUS occurs inside the domain of high plateau, the high plateau contour is ceased, and the prosodic pattern of FOCUS appears. On the other hand, in FJ, the high plateau pattern continues even when a FOCUS intervenes the wh-scope marking, showing that the high plateau type of wh-intonation overrides a FOCUS (Kubo, p.c.). Yet, an experimental support is required for the predictions. The proposed examination will shed light on the role of prosody in the interpretation of FOCUS and wh-scope, which has not been subject to extensive experimental investigation.

Though the current study is confined to bi-clausal wh-interrogatives with the Comp corresponding to *whether*, I believe that similar interactivities among various components of a language can be found in numerous other constructions. Also, the issues of interfaces and experimental approaches pursued in the present study should be extended to additional varieties or languages with similar structures.

APPENDIX

A. Material for the production test in Chapter 3

For FJ, only distinct parts from TJ are given in parenthesis following the corresponding TJ items. For the version of LD-scrambling, which is omitted here, an embedded wh/DP is extracted to the initial position of each sentence.

<TJ, FJ>

AJ-1. Target sentences for DP embedded

(a) READ set

Ryoo-wa Yumi-ga Demian-o (-ba) yonda-ka Naoya-ni kiite-mita-tte.
-Top -Nom Demian-Acc read-Comp -Dat ask-tried-Quot

‘I heard that Ryoo asked Naoya if Yumi read Demian.’

(b) DRINK set

Mao-wa Goroo-ga ramu-o (-ba) nonda-ka Mie-ni kiite-mita-tte.
-Top -Nom rum-Acc drank-Comp -Dat ask-tried-Quot

‘I heard that Mao asked Mie if Goroo drank rum.’

(c) KNIT set

Jyun-wa Ruri-ga mahura-o (-ba) anda-ka Mari-ni kiite-mita-tte.
-Top -Nom muffler-Acc knitted-Comp -Dat ask-tried-Quot

‘I heard that Jyun asked Mari if Ruri knitted a muffler.’

AJ-2. Contexts for DP embedded

(a) READ set

- FOCUS: Ryoo-wa nannde sonnani Yumi-ni kyoomi-ga aru-no (-to)?
-Top why so -Dat interest-Nom is-Q

Yumi-ga Demian-o (-ba) yonda-ka Yumi-no oneechan-ni kiite-mita-tte?
-Nom Demian-Acc read-Comp -Gen sister-Dat ask-tried-Q

‘Why is Ryoo so interested in Yumi? He asked Yumi’s sister if Yumi read Demian, right?’

- New: Ryoo-wa nani-o (nan-ba) sita-tte? ‘What did you say Ryoo did?’
-Top what-Acc did-Quot

- Given: Ryoo-wa Naoya-ni nani-o (nan-ba) kiite-mita-tte?
-Top -Dat what ask-tried-Q

‘Do you know what Ryoo asked Naoya?’

(b) DRINK set

- FOCUS: Mao-wa nannde sonnani Ruri-ni kyoomi-ga aru-no (-to)?
-Top why so -Dat interest-Nom is-Q

Goroo-ga ramu-o (-ba) nonda-ka Goroo-no oneechan-ni kiite-mita-tte?
-Nom rum-Acc drank-Comp -Gen sister-Dat ask-tried-Q

‘Why is Mao so interested in Goroo? She asked Goroo’s sister if Goroo drank rum, right?’

- New: Mao-wa nani-o (nan-ba) sita-tte? ‘What did you say Mao did?’
-Top what-Acc did-Quot

- Given: Mao-wa Mie-ni nani-o (nan-ba) kiite-mita-tte?
-Top -Dat what ask-tried-Q

‘Do you know what Mao asked Mie?’

(c) KNIT set

- FOCUS: Jyun-wa nannde sonnani Ruri-ni kyoomi-ga aru-no (-to)?
-Top why so -Dat interest-Nom is-Q

Ruri-ga mahura-o (-ba) anda-ka Ruri-no oneechan-ni kiite-mita-tte?
-Nom muffler-Acc knitted -Gen sister-Dat ask-tried-Q

‘Why is Jyun so interested in Ruri? He asked Ruri’s sister if Ruri knitted a muffler, right?’

- New: Jyun-wa nani-o (nan-ba) sita-tte? ‘What did you say Jyun did?’
-Top what-Acc did-Quot

- Given: Jyun-wa Mari-ni nani-o (nan-ba) kiite-mita-tte?
-Top -Dat what ask-tried-Q

‘Do you know what Jyun asked Mari?’

AJ-3. Target sentences for wh embedded

(a) READ set

Ryoo-wa Yumi-ga nani-o (nan-ba) yonda-ka Naoya-ni kiite-mita-tte.
-Top -Nom what-Acc read-Comp -Dat ask-tried-Quot

‘I heard that Ryoo asked Naoya what Yumi read.’

(b) DRINK set

Mao-wa Goroo-ga nani-o (nan-ba) nonda-ka Mie-ni kiite-mita-tte.
-Top -Nom what-Acc drank-Comp -Dat ask-tried-Quot

‘I heard that Mao asked Mie what Goroo drank.’

(c) KNIT set

Jyun-wa Ruri-ga nani-o (nan-ba) anda-ka Mari-ni kiite-mita-tte.
-Top -Nom what-Acc knitted-Comp -Dat ask-tried-Quot

'I heard that Jyun asked Mari what Ruri knitted.'

AJ-4. Contexts for wh embedded

(a) READ set

- FOCUS: Ryoo-wa nannde sonnani Yumi-ni kyoomi-ga aru-no (-to)?
-Top why so -Dat interest-Nom is-Q

Yumi-ga nani-o (nan-ba) yonda-ka Yumi-no oneechan-ni kiite-mita-tte?
-Nom what-Acc read-Comp -Gen sister-Dat ask-tried-Q

'Why is Ryoo so interested in Yumi? He asked Yumi's sister what Yumi read, right?'

- New: Ryoo-wa nani-o (nan-ba) sita-tte? 'What did you say Ryoo did?'
-Top what-Acc did-Quot

- Given: Ryoo-wa Naoya-ni nani-o (nan-ba) kiite-mita-tte?
-Top -Dat what ask-tried-Q

'Do you know what Ryoo asked Naoya?'

(b) DRINK set

- FOCUS: Mao-wa nannde sonnani Goroo-ni kyoomi-ga aru-no (-to)?
-Top why so -Dat interest-Nom is-Q

Goroo-ga nani-o (nan-ba) nonda-ka Goroo-no oneechan-ni kiite-mita-tte?
-Nom what-Acc drank-Comp -Gen sister-Dat ask-tried-Q

'Why is Mao so interested in Goroo? She asked Goroo's sister what Goroo drank, right?'

- New: Mao-wa nani-o (nan-ba) sita-tte? 'What did you say Mao did?'
-Top what-Acc did-Quot

- Given: Mao-wa Mie-ni nani-o (nan-ba) kiite-mita-tte?
-Top -Dat what ask-tried-Q

'Do you know what Mao asked Mie?'

(c) KNIT set

- FOCUS: Jyun-wa nannde sonnani Ruri-ni kyoomi-ga aru-no (-to)?
-Top why so -Dat interest-Nom is-Q

Ruri-ga nani-o (nan-ba) anda-ka Ruri-no oneechan-ni kiite-mita-tte?
 -Nom what-Acc knitted-Comp -Gen sister-Dat ask-tried-Q

‘Why is Jyun so interested in Ruri? He asked Ruri’s sister what Ruri knitted, right?’

- New: Jyun-wa nani-o (nan-ba) sita-tte? ‘What did you say Jyun did?’
 -Top what-Acc did-Quot

- Given: Jyun-wa Mari-ni nani-o (nan-ba) kiite-mita-tte?
 -Top -Dat what ask-tried-Q
 ‘Do you know what Jyun asked Mari?’

<SKK>

AK-1. Target sentences for DP embedded

(a) READ set: Yengwu-nun Yumi-ka Deymian-ul ilkessnun-ci
 -Top -Nom Demian-Acc read-Comp
 Minho-hantey mwule-pwassta-nta
 -Dat ask-tried-Quot

‘I heard that Yengwu asked Minho if Yumi read Demian.’

(b) EAT set: Yengmi-nun Myengwu-ka manul-ul mekessnun-ci
 -Top -Nom garlic-Acc ate-Comp
 Ari-hantey mwule-pwassta-nta
 -Dat ask-tried-Quot

‘I heard that Yengmi asked Ari if Myengwu ate garlics.’

(c) MAKE set: Minki-nun Yenga-ka yangmal-ul mantuleessnun-ci
 -Top -Nom socks-Acc made-Comp
 Mira-hantey mwule-pwassta-nta
 -Dat ask-tried-Quot

‘I heard that Minki asked Mira if Yenga made socks.’

AK-2. Contexts for DP embedded

(a) READ set

- FOCUS: Yengwu-nun way kulehkey Yumi-hantey kwansim-i
 -Top why so -Dat interest-Nom

manh-no? Yumi-ka Deymian-ul ilkessnun-ci
 plenty-Q -Nom Demian-Acc read-Comp

Yumi unni-hantey mwule-pwassta-mye?
sister-Dat ask-tried-Q

‘Why is Yengwu so interested in Yumi? He asked Yumi’s sister if Yumi read Demian, right?’

- New: Yengwu-nun me-lul hayssta-ko? ‘You said Yengwu did what?’
-Top what did-Quot

- Given: Yengwu-nun Minho-hantey me-lul mwule-pwassta-no?
-Top -Dat what ask-tried-Q

‘Do you know what Yengwu asked Minho?’

(b) EAT set

- FOCUS: Yengmi-nun way kulehkey Myengwu-hantey kwansim-i
-Top why so -Dat interest-Nom

manh-no? Myengwu -ka manul-ul mekessnun-ci
plenty-Q -Nom garlic-Acc ate-Comp

Myengwu nwuna-hantey mwule-pwassta-mye?
sister-Dat ask-tried-Q

‘Why is Yengmi so interested in Myengwu? He asked Myengwu’s sister if Myengwu ate garlic, right?’

- New: Yengmi-nun me-lul hayssta-ko? ‘You said Yengmi did what?’
-Top what did-Quot

- Given: Yengmi-nun Ari-hantey me-lul mwule-pwassta-no?
-Top -Dat what ask-tried-Q

‘Do you know what Yengmi asked Ari?’

(c) MAKE set

- FOCUS: Minki-nun way kulehkey Yenga-hantey kwansim-i
-Top why so -Dat interest-Nom

manh-no? Yenga-ka yangmal-ul mantulelessnun-ci
plenty-Q -Nom socks-Acc made-Comp

Yenga unni-hantey mwule-pwassta-mye?
sister-Dat ask-tried-Q

‘Why is Minki so interested in Yenga? He asked Yenga’s sister if Yenga made socks, right?’

- New: Minki-nun me-lul hayssta-ko? ‘You said Minki did what?’
-Top what did-Quot

- Given: Minki-nun Mira-hantey me-lul mwule-pwassta-no?
 -Top -Dat what ask-tried-Q

‘Do you know what Minki asked Mira?’

AK-3. Target sentences for wh embedded

(a) READ set: Yengwu-nun Yumi-ka me-lul ilkessnun-ci
 -Top -Nom what-Acc read-Comp

Minho-hantey mwule-pwassta-nta
 -Dat ask-tried-Quot

‘I heard that Yengwu asked Minho what Yumi read.’

(b) EAT set: Yengmi-nun Myengwu-ka me-ul mekessnun-ci
 -Top -Nom what-Acc ate-Comp

Ari-hantey mwule-pwassta-nta
 -Dat ask-tried-Quot

‘I heard that Yengmi asked Ari what Myengwu ate.’

(c) MAKE set: Minki-nun Yenga-ka me-lul mantulesn-nun-ci
 -Top -Nom what-Acc made-Comp

Mira-hantey mwule-pwassta-nta
 -Dat ask-tried-Quot

‘I heard that Minki asked Mira what Yenga made.’

AK-4. Contexts for wh embedded

(a) READ set

- FOCUS: Yengwu-nun way kulehkey Yumi-hantey kwansim-i
 -Top why so -Dat interest-Nom

manh-no? Yumi-ka me-lul ilkessnun-ci
 plenty-Q -Nom what-Acc read-Comp

Yumi unni-hantey mwule-pwassta-mye?
 sister-Dat ask-tried-Q

‘Why is Yengwu so interested in Yumi? He asked Yumi’s sister
 what Yumi read, right?’

- New: Yengwu-nun me-lul hayssta-ko? ‘You said Yengwu did what?’
 -Top what did-Quot

- Given: Yengwu-nun Minho-hantey me-lul mwule-pwassta-no?
 -Top -Dat what ask-tried-Q

(b) EAT set

(c) MAKE set

- 'Do you know what Minki asked Mira?'

B. Material for the production test in Chapter 4

For the formal style, the distinct parts from informal style are given in *italics>.*

<TJ, FJ>

BJ-1. DATE set

(a) embedded scope

A: mosimosi, Tomomi-chan? Raishuu, tomodachi-o (-ba)
senpai-o (-ba)
hello next.week friend-Acc

shookaisite-kureru-tte (-totte)? Arigatoo! Demo, atode,
introduce-for.me-Quot? Thanks But later

sono hito-o (-ba) kiniitta-kadooka-wa kikanaide (kikande).
the person-Acc liked-whether.or.not-Top ask.not.

Sono kawari-ni watasi-ga sonohito-o (-ba) kiniittara
that instead I-Nom the.person-Acc liked.if.

sonohito-ni [ryoori-ga suki-ka]-o (-ba) tazune-te,
the.person.-to [cooking-Nom like-Q]-Acc ask-and

kiniiranakattara (kiniirankattara) nanimo tazunenai-kara (tazunenkara)
not.like.if anything not.ask-because

atode sono tomodachi-ni kiite-mite.

senpai
later that friend-to ask-try

`Hello? Tomomi? Are you saying you'll introduce your friend/senpai to me? Thanks! But, later, don't ask me whether I liked him or not. Instead, if I like him, I'll ask him [do you like cooking?], and if I don't, I won't ask anything. So ask him later (whether I asked him something).'

(Deeto-no ato, shookaisit tomodachi-ni atta Tomomi-chan)

senpai
date-Gen after, introduced friend-with met

'After the blind date, Tomomi met the friend/senpai she introduced'

B: Yuu-chan, watasi-no tomodachi-to atta-toki, kanojyo-wa Yuu-chan-ga

senpai *senpai*
I-Gen friend-with met-time, she-Top -Nom

nani-ga (nan-ga) suki-ka tazuneta-no (tazuneta-to)?
tazunemasita-ka (tazunetorimasita-ka)

BJ-2. FORGERY set

(a) embedded scope

A: konoaida, Ando kaichoo-ga gijyobunshoo-o (-ba) kakusita-ka
the.other.day, chairman-Nom forged.document-Acc hided-Comp
chooshasitotta (chooshasitotta)-deshoo? Konkai mata sono kaichoo-ga
investigated-right? This.time again that chairman-Nom
nanika kakusita yoogi-ga aru(aruto)-kedo
something hided suspicion-Nom be-though
mada nani-o (nan-ba) kakusita-ka wakaranai (wakaran)-mitai
yet what-Acc hided-Comp not.know-Quot
'You know that (the police) investigated whether Chairman Ando hided
a forged document the other day, right? This time, again, he is suspected
whether he hided something. But I heard that it has not become known
what he hided yet.'

B: dakara (daken), keesatsu-wa Ando-kaichoo-ga
so, police-Top chairman-Nom
nani-o (nan-ba) kakusita-ka sirabeteru-no (sirabetoo-to)?
sirabete-masuka (sirabetooto-desuka)?
What-Acc hided-Comp be.investigating-Q
'So, are the police investigating what Ando hided?'

(b) matrix scope

A: konoaida, Ando kaichoo-ga gijyobunshoo-o (-ba) kakusita-ka
the.other.day, chairman-Nom forged.document-Acc hided-Comp
chooshasitotta (chooshasitotta)-deshoo? Konkai mata sono kaichoo-ga
investigated-right? This.time again that chairman-Nom
nanika-o kakusita yoogi-ga a-tte hontooni
something-Acc hided suspicion-Nom be-and really
kaichoo-ga sore-o (nan-ba) kakusita-ka sirabeteru-tte
chairman-Nom what-Acc hided-Comp be.investigating-Quot
'You know that (the police) investigated whether Chairman Ando hided
a forged document the other day, right? This time, again, he is suspected
whether he hided something. So I heard that the police are investigating
if he really hided it.'

B: konkai-wa nani-kasira? keesatsu-wa Ando-kaichoo-ga
 this.time what-could.be? police-Top chairman-Nom
 nani-o (nan-ba) kakusita-ka sirabeteru-no (sirabetoo-to)?
 What-Acc hided-Comp *sirabete-masuka (sirabetooto-desuka)?*
 be.investigating-Q
 ‘What could it be, this time? What is it that the police are investigating if
 Chairman Ando hided?’

BJ-3. NURSE set

(a) embedded scope

A: konoaida byooiin-de okotta jiken-de hankoo-ni
 the.other.day hospital-Loc occurred crime-about crime-for
 tsukawareta kyooki-o (-ba) mitsuketa-kedo sore-wa hankoo-no
 was.used weapon-Acc found-though it-Top crime-Gen
 zenjitsu-ni kawareta mono-rasii (-rasika) -yo
 the.day.before-on was.bought thing-Quot-Assertive
 ‘The weapon used for the crime occurred in the hospital the other day
 was found, and I heard it was bought on the day before.’
 B: soo? Sorede keesatsu-wa dare-ga sore-o (-ba) katta-ka
 really then police-Top who-Nom it-Acc bought-Comp
 sirabeteru-no (sirabetoo-to)?
sirabetemasu-ka (sirabetooto-desuka)?
 be.investigating-Q
 ‘Really? Then, are the police investigating who bought it?’

(b) matrix scope

A: konoaida byooiin-de okotta jiken-de hankoo-ni
 the.other.day hospital-Loc occurred crime-about crime-for
 tsukawareta kyooki-o (-ba) mitsuketa-kedo husigina kangosi-ga
 was.used weapon-Acc found-though suspicious nurse-Nom
 hitori i-te, sono hito-ga sore-o (-ba) katta-ka
 one.person be-and the person-Nom it-Acc bought-Comp
 sirabeteru (sirabetoo)-tte.
 be.investigating-Quot

‘The weapon used for the crime occurred in the hospital the other day was found, and there is a suspicious nurse. I heard that the police are investigating whether she bought it.’

B: Ah, watasi, sono byooin-no kangositachi-o yoku sitteru (sitto)!
I that hospital-Gen nurses-Acc well be.knowing

Dare-kasira (-kaina), sono kangosi... keesatsu-wa dare-ga
who-could.be that nurse police-Top who-Nom

sore-o (-ba) katta-ka sirabeteru-no (sirabetoo-to)?
it-Acc bought-Comp be.investigating-Q
sirabetemasu-ka (sirabetooto-desuka)?

‘Ah, I know well the nurses in the hospital! Who could it be...? Who is it that the police investigating if she bought it?’

BJ-4. SUSPECT set

(a) embedded scope

A: Yumi-ga senshuu-no doyoobi-ni korosareta-rasiiyo (-kena).
-Nom last-Nom Saturday-on was.killed-Quot

de, sonohi Yumi-wa dareka-ni atta (attotta)-mitai.
but that.day -Top someone-with met-seem

Keesatsu-ga uchi-ni-mo kita (kitotta)-wa.
police-Nom me-to-too had.come-ending

‘I heard that Yumi was killed last Saturday. It is said that Yumi met someone on that day. The police came to my place, too’

B: soo? keesatsu-wa Yumi-ga sonohi dare-ni atta-ka
really police-Top -Nom that.day who-Acc met-Comp

tazuneta-no (-to)?
tazunemasita-ka (tazunetorimasita-ka)
asked-Q

‘Really? Did the police ask who Yumi met on that day?’

(b) matrix scope

A: Yumi-ga senshuu-no doyoobi-ni korosareta-rasiiyo (-kena).
-Nom last-Nom Saturday-on was.killed-Quot

tokorode, yoogisha-ga i-te sonohi Yumi-ga sono hito-ni
but suspect-Nom be-and that.day -Nom that person-with

atta (attotta)-ka sirabeteru (sirabetoo) mitai-desu.
met-Comp be.investigating seem-ending

Keesatsu-ga uchi-ni-mo tazune-ni kitemasita.
kitorimasi-ta.
 police-Nom me-to-too ask-for had.come

‘I heard that Yumi was killed last Saturday. It seems that there is a suspect, and the police are investigating whether Yumi met him on that day. The police came to question me, too’

B: sono yoogisha-tte dare-kasira (-kaina)? keesatsu-wa Yumi-ga
 the suspect-Quot who-could.be? police-Top -Nom
 sonohi dare-ni atta-ka tazuneta-no (-to)?
tazunemasita (tazunetorimasita)-ka
 that.day who-Acc met-Comp asked-Q?
 ‘Who could the suspect be? Who is it that the police ask whether Yumi met on that day?’

<SKK>

BK1. DATE set

(a) embedded scope

A: yeposeyyo, Yumi? taumcwuey senpay sokausikye-cunta-ko?

hello, Yumi? next.week senior introduce-for.me-Quot?

komapta! kuntay, nacungey, ku chinkwu-ga maumeytulesnun-ci
 Thanks But later the person-Nom liked-whether

an tulesnun-ci-nun mwutcimala. taysiney ku salam-i
 not liked-whether-Top don't.ask instead the person-Nom

maumeytul-myen ku salam-hantey [yenghwa cohahanun-ci]
 liked-if the person-to [movie like-if]

mule-po-ko, maumeyantul-myen amwukesto an mwule-po-lkenikka
 ask-try-and like.not-if anything not ask-try-because

nacungey ku chinkwu-hantey mwule-pwala.
 later that friend-to ask-try

‘Hello? Yumi? Are you saying you’ll introduce your senior student to me? Thanks! But, later, don’t ask me whether I liked him or not. Instead, if I like him, I’ll ask him [do you like a movie?], and if I don’t, I won’t ask anything. So ask him later (whether I asked him something).’

(sokayting hwu, sokayhaycun senpay-lul mannan Yumi)
 blind.date after introduced senior-Acc met

‘After the blind date, Yumi met the senior student she introduced’

B: senpay, nay chinkwu mannassul-ttay, ku chinkwu-ka
my friend met-time that friend-Nom
senpay-ga me cohahanun-ci mwule-pwass-eyo?
-Nom what like-Comp ask-tried-Q *-pnika*

‘Senpai, when you met my friend, what did she ask you like?’

(b) matrix scope

A: yeposeyyo, Yumi? taumcwuey senpay sokausikye-cunta-ko?
hello, Yumi? next.week senior introduce-for.me-Quot?

komapta! kuntay, nacungey, ku chinkwu-ga maumeytulesnun-ci
Thanks But later the person-Nom liked-whether

an tulesnun-ci-nun mwutcimala. taysiney ku salam-i
not liked-whether-Top don’t.ask instead the person-Nom

maumeytul-myen ku salam-hantey [yenghwa cohahanun-ci]
liked-if the person-to [movie like-if]

mule-po-ko, maumeyantul-myen [yori cohahanun-ci]
ask-try-and like.not-if cooking like-if

mwule-po-lkenikka nacungey ku chinkwu-hantey mwule-pwala.
ask-try-because later that friend-to ask-try

‘Hello? Yumi? Are you saying you’ll introduce your senior student to me? Thanks! But, later, don’t ask me whether I liked him or not. Instead, if I like him, I’ll ask him [do you like a movie?], and if I don’t, I’ll ask [do you like cooking?]. So ask him later what it is that I asked him whether he likes)’.

B: senpay, nay chinkwu mannassul-ttay, ku chinkwu-ka
my friend met-time that friend-Nom
senpay-ga me cohahanun-ci mwule-pwass-eyo?
-Nom what like-Comp ask-tried-Q *-pnika*

‘Senpay, when you met my friend, what did she ask you like?’

BK2. FORGERY set

(a) embedded scope

A: cinanpeney Yu-hoychang-i wicomwunse swumkyessnun-ci
last.time Yu-chairman-Nom forged.document hided-if

cosahayss-cyanayo? ipeney ku hoicang-i tto mwel
investigated-right this.time that chairman-Nom again something

swumkyesstanun hyemui-ka issnun-de
hided suspect-Nom be-but

acik mwel swumkyessnun-ci-nun molun-tayyo.
yet what hided-if-Top not.know-Quot

‘You know that (the police) investigated whether Chairman Yu hided a forged document the other day, right? This time, again, he is suspected whether he hided something. But I heard that it has not become known what he hided yet.’

B: kulayse, kyengchal-un Yu-hoychang-i me-l
so, police-Top Yu-chairman-Nom what

swumkyessnun-ci cosahakoiss-eyo?
-pnika

hided-Comp be.investigating-ending?

‘So, are the police investigating what Chairman Yu hided?’

(b) matrix scope

A: cinanpeney Yu-hoychang-i wicomwunse swumkyessnun-ci
last.time Yu-chairman-Nom forged.document hided-if

cosahayss-cyanayo? ipeney ku hoicang-i tto mwel
investigated-right this.time that chairman-Nom again something

swumkyesstanun hyemui-ka issnun-de cengmallo hoychang-i
hided suspect-Nom be-but really chairman-Nom

kuku-l swumkyessnun-ci cosahakoiss-tayyo.
that-Acc hided-if be.investigating-Quot

‘You know that (the police) investigated whether Chairman Yu hided a forged document the other day, right? This time, again, he is suspected whether he hided something. I heard that the police are investigating if he really hided that.’

B: kulayse, kyengchal-un Yu-hoychang-i me-l
 so, police-Top Yu-chairman-Nom what
 swumkyessnun-ci cosahakoiss-eyo?
 -*pnika*
 hided-Comp be.investigating-ending?
 ‘What could it be, this time? What is it that the police are investigating
 if Chairman Yu hided?’

BK3. NURSE set

(a) embedded scope

A: cinanben, byengwon-eyse nan ku saken, pemhayng-ey ssuin
 last.time hospital-Loc occurred the crime crime-for used
 hyungki-lul palkyenhas-tayyo. Pemhayng cennal phallin
 weapon-Acc found-Quot crime the.day.before sold
 ke-ranuntey, acik nwu-ka sassnun-ci molu-ntayyo.
 thing-Quot, yet who-Nom bought-Comp not.know-Quot
 ‘The weapon used for the crime occurred in the hospital the other day
 was found, and I heard it was bought on the day before.’
 B: kulayse, kyengchal-un nwu-ka kuke-l sassnun-ci
 so police-Top who-Nom that-Acc bought-Comp
 swusahakoiss-eyo?
 -*pnika?*
 be.investigatng-Q?
 ‘So, are the police investigating who bought it?’

(b) matrix scope

A: cinanben, byengwon-eyse nan ku saken, pemhayng-ey ssuin
 last.time hospital-Loc occurred the crime crime-for used
 hyungki-lul palkyenhas-tayyo. Pemhayng cennal phallin
 weapon-Acc found-Quot crime the.day.before sold
 ke-ranuntey, swusanghan kanhosa-ka han myeng iss-ese,
 thing-Quot, suspicious nurse-Nom one Cl be-and
 ku saram-i kuke-l sassnun-ci swusahakoitta-neyyo.
 that person-Nom that-Acc bought-if be.investigating-Quot

‘The weapon used for the crime occurred in the hospital the other day was found, and there is a suspicious nurse. I heard that the police are investigating whether she bought it.’

B: nwukwul-ka, ku kanhosa...? na, ku byengwon kanhosatul cal
 who-Q the nurse I the hospital nurses well

anundey... kyengchal-un nwu-ka kuke-l sassnun-ci
 know... police-Top who-Nom that-Acc bought-Comp

swusahakoiss-eyo? Hoksi, a-sey-yo?
-pnika *-si-pnika*
 be.investigatng-Q? perhaps know-Hon-ending

‘Ah, I know well the nurses in the hospital! Who could it be...? Who is it that the police investigating if she bought it? Do you know, perhaps?’

BK4. SUSPECT set

(a) embedded scope

A: Yumi-ka cinan thoyoil-ey salhaytanghayss-tayyo.
 Yumi-Nom last Saturday-on was.killed-heard
 kulentay, kunal Yumi-ka nwukwunka-lul mannassta-nuntey.
 but that.day Yumi-Nom someone-Acc met-is.said
 Kyengchal-i ce-hantey-to wassess-eyo.
 police-Nom me-to-too had.come-ending

‘I heard that Yumi was killed last Saturday. It is said that Yumi met someone on that day. The police came to my place, too’

B: kulayse, kyengchal-un kunal Yumi-ka nwukwu-lul
 so police-Top that day Yumi-Nom who-Acc
 mannassnun-ci mwuless-eyo?
-pnika
 met-Comp asked-ending

‘So, did the police ask who Yumi met on that day?’

(b) matrix scope

A: Yumi-ka cinan thoyoil-ey salhaytanghayss-tayyo.
 Yumi-Nom last Saturday-on was.killed-heard
 Kulentay, yonguyca-ka iss-ese kunal Yumi-ka
 but suspect-Nom exist-and that.day Yumi-Nom
 ku salam-ul mannassnun-ci cosaha-napwayo.
 that person-Acc met-Comp investigate-seem

Kyengchal-i ce-hantey-to mwul-ule wassess-eyo.
 police-Nom me-to-too ask-for had.come-ending

'I heard that Yumi was killed last Saturday. It seems that there is a suspect, and the police are investigating whether Yumi met him on that day. The police came to question me, too'

B: kulayse, kyengchal-un kunal Yumi-ka nwukwu-lul
 so police-Top that day Yumi-Nom who-Acc
 mannassnun-ci mwuless-eyo?
 met-Comp ^{-pnika} asked-ending

'So, who is it that the police ask whether Yumi met on that day?'

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